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A NATURAL HISTORY OF THE

BRITISH LEPIDOPTERA

THEIR WORLD-WIDE VARIATION AND GEOGRAPHICAL DISTRIBUTION.

A TEXT-BOOK FOR STUDENTS AND COLLECTORS.

BY

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Author of "A Natural History of the British Lepidoptera," "A Natural History of the British Alucitides," "The British Noctuæ and their Varieties," "Monograph of the British Pterophorina," "British Butterflies," "British Moths," "Migration and Dispersal of Insects," "Melanism and Melanochroism in Lepidoptera," "Practical Hints for the Field Lepidopterist," etc.

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PREFACE.

With many misgivings we present another of our volumes of *A Natural History of the British Lepidoptera* to our subscribers. The misgivings arise chiefly from our own feeling that, hard as we have striven to reach our ideal, we have in many ways failed signally to do so. Yet it is hoped that the labour expended on the present book will be considered by our supporters as a fair attempt to present to them a connected account of the biology of the species in a clear and easily understood form, whilst giving also a full, comprehensive, and detailed survey of the history and literature of the insects treated.

Although for some 140 years naturalists have known most of the few species here dealt with, and, although references innumerable have been made to them, yet, on the biological side, scarcely anything has been done. To this statement, exception must be made in the case of Zeller's short outlines of the life-history of *Everes argiades* and *Cupido minimus*, Edwards' brief account of the American form of the former species, and Frohawk's ontogenetic outline concerning the summer form of the same species, as well as similar outlines of those of *Plebeius argus* and *Cyaniris semiargus*, the latter published whilst this volume has been going through the press. If to these we add Buckler's brief notes on *Cupido minimus* and *Plebeius argus*, we shall have noticed almost everything that has been done in this direction. These brief accounts are, however, altogether wanting in the details that enable us to make use of the early stages for classificatory purposes. For these details, as before, we are indebted to the masterly descriptions prepared for this work by Dr. T. A. Chapman.

Of the imagines, much has been written; often the records have been vague, uncertain, and frequently incorrect, and dealing with this published material has been our great trouble. Authorities (!) unable to name their species, failure to discriminate between allied species, doubt thrown by the more intelligent collectors on the specific value of forms of the species captured in outlying districts, all represent sources of endless work and trouble in unravelling the tangles in the skeins which they have attempted to manipulate. Ignorance of structural characters, which has led the more superficial among our systematists and catalogue-makers to lump species belonging to the most diverse groups of blues into one huge genus—*Lycaena*, *Polyommatus*, or whatever name the peculiar temperament of the individual may select, for in no case do such men study the subject *de novo*—has not lessened the almost hopeless muddle. We have already shown (in vol. ix) the amazing differences between the Lampidid and Celastrinid tribes, when compared with the main group of Plebeiid blues. We now show the equally great difference between the Everids and the Plebeiids, and, at the same time, are attempting to indicate how the latter break up into natural groups, often quite easy to discriminate by a mere inspection of the imagines, and frequently supported by details of structure in the egg, larval, and pupal stages. We do not expect the mass of lepidopterists yet to follow us in this branch of our work; the detailed knowledge required to separate the species of the genus *Plebeius* (*argus*, etc.) from those of *Cyaniris* (*semiargus*, etc.) and *Agriades* (*thetis*, etc.), is not to be expected from lepidopterists who attempt to study the whole order Lepidoptera in part of a very limited life-time, and our conclusions are sure to be resented by those who do not grant that, or act as if they did not consider that, the human mind was bound by limitations of time and space. Nor is it offered to those lepidopterists whose knowledge is based wholly on the study of the imagines, and who are ignorant of the early stages of the species. Yet there is surely not a lepidopterist who can name his Palæarctic butterflies, who will not grant that the species we have included respectively in our genera *Plebeius*, *Cyaniris*, and *Agriades*, are naturally more closely allied to one another than to the species in the other groups, and form, *per se*, natural groups in themselves, and, if natural groups, then genera—the genus being, as we maintain, whilst our nomenclature is binomial (consisting of a generic and specific name), the group name next above species. The superficial arrangement previously adopted is well indicated in our different treatment of two species with which we deal in this volume. Hitherto, based evidently on the apparent similarity of the spotting of the underside, *minimus* and *semiargus* have been kept next to each other in our lists and catalogues, but, as we have shown, the former is, in all its essential structural characters, a quite typical Everid, whilst the latter is, in the same way, a quite typical Plebeiid, a view abundantly proved by the character of the spotting alone, if the oriental rather than the western forms of the species be considered.

The labour involved in the study of the variation of these species has been enormous. We have given the original description (or a translation thereof) of every form that we have discovered in literature. We have treated and judged each form separately on its merits, and based our opinion on the original description or figure. The remarkably wide distribution of *Everes argiades*, a sedentary species, over almost half the known habitable world, under varying conditions of environment resulting in a number of slight local modifications, has led to the study of the Everids of the world, and the incidental recognition of new specific forms, as well as the disproving of the superficial conclusions reached by certain authors concerning our southern and south-eastern Asiatic species, some of whom have lumped the most diverse species under the specific name *argiades*. These conclusions are indicated in our book, the details would be out of place here.

There has been no real trouble when one has come to grips structurally with the various forms of the species treated. The structural peculiarities exhibited by the local races, or "varieties" as they are properly called, fall well within the specific limits of the species. There has been no evidence that present environmental conditions are more than maintaining the really superficial varietal characters, or effecting any deeper-seated permanent biological changes than are recognised in "varieties," *i.e.*, local races. Dr. Chapman has shown that the characters separating *Everes argiades*, Pallas, *E. alcetas*, Hb., *E. dipora*, Moore, and *Binghamia parrhasius*, Fabr., are absolute. Want of material leaves us less satisfied with the North American forms, but our collaborator, Mr. G. T. Bethune-Baker, proposes, we believe, to work these out, and has already commenced to accumulate material. Similarly, our attention has so far been occupied with disentangling the confusion that has been woven round the oriental forms of *Cyaniris semiargus*, that we have paid less attention than we ought to their relative value; nor are we fully satisfied that we have wholly cleared up the muddle that has arisen through the misapplication of the name *polonus*, Zell., by Staudinger, who referred the blue race of the allied *Agriades coridon* from the Taurus, to *A. thetis*, as a variety under this name. But there cannot be the slightest doubt of the absolute distinction of the two common Plebeiids, *Plebeius argus* (*aegon*) and *P. argyrognomon*, throughout the whole range of their distribution; their parallelism in superficial appearance is remarkable, but their structural characters are most definite and absolute, and leave no justification for Staudinger's statement that in certain districts they were still not properly differentiated as species.

An important point that has influenced the smaller number of species with which we have been able to deal in this volume, is that of the illustrations. Thanks to the energy and generosity of Dr. T. A. Chapman, we have been supplied with a large number of photographs of biological details, mounted by himself and reproduced by Mr. F. Noad Clark, to illustrate his section of the work. In addition we have also to thank Messrs. Hugh Main and A. E. Tonge for further photographs dealing with the early stages of the species treated. We have also received large numbers of figures and photographs of aberrations of the different species which we have, as far as possible, utilised in our illustrations of the imagines. Some of these have, and others have not, been published previously; we have selected from those sent the figures that best illustrate the points of variation discussed, and thank the various donors for their kindness. The publication of some 53 plates has somewhat lessened the space at disposal for letterpress, but this still comes to more than 400 pages, although to get as much systematic work in as possible, we have reduced the preliminary chapters to 3, which, however, complete our series of essays on "Family habits in butterfly larvæ."

On the literary side of our work we have received equally important aid. To Mr. G. Bethune-Baker, Professor Charles Blachier, Mr. H. Rowland-Brown, Mr. Stanley Edwards, Mr. Max Gillmer, Dr. J. L. Reverdin, Mr. Alfred Sich, and the Rev. George Wheeler, our most sincere thanks are due; to Mr. Stanley Edwards we owe so much that it would have been impossible to have completed this volume in half the time had he not acted as a most able amanuensis and extractor, obtaining from the old authors in the museum libraries, excerpts which we ourselves could never have hoped to have spared time to obtain. Although we have lost our Hungarian colleague by the lamented death of Mr. Aigner-Abafi of Buda-Pest, we have received a promise of help from the well-known Croatian entomologist, Mr. August Grund, so that our knowledge of the eastern forms of our insects is not likely to be in any way lessened, but rather increased by his kind co-operation.

Mr. Heron has, as usual, made our work at the Natural History Museum as effective as possible, by helping us to make the most of the limited time at our disposal when there, whilst Mr. H. J. Turner has again kindly undertaken the compilation of the "Synopsis of Contents" and the "Special Index." In a work of this scope and magnitude, reference to almost any particular detail will show that other helpers have never been wanting, and it is by the kindness of these that the production of the volume in its completed form has been made possible.

We hope our subscribers will not be dissatisfied with the contents. Another volume will take the rest of the Lycænids and Erycinids, after which, one may suppose, there will be, among the larger butterflies, less field for quite new work and new discoveries, and less room for the thankless task of critical scold to earlier workers in the same field.

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BRITISH BUTTERFLIES.

CHAPTER I.

FAMILY HABITS IN BUTTERFLY LARVÆ—THE CHRYSOPHANIDS.

In continuation of the opening chapters in the preceding volume on the "Family habits of butterfly larvæ," we propose to deal with those groups not yet attempted. The first of these are the "copper" butterflies. Closely as are the "coppers" and "blues" allied in most of their structural features, similar as they are in many of their habits both as larvæ and imagines, yet in other of their larval habits they exhibit considerable differences. A noteworthy feature of the Chrysophanid larvæ is the way in which the head and limbs are completely roofed over. In this respect they differ considerably from most Lycænid larvæ. It may be also noted that, whilst many Lycænid larvæ are flower- and seed-eaters, the Chrysophanid larvæ appear to strictly confine themselves to leaves.

We have already dealt with the larval habits of the "hairstreaks" (in the preceding volume, p. 61) and "blues" (p. 66), to which reference should be made for comparative purposes. One may note here that, so far, the symbiotic connection that appears to be so frequent (if not universal) between ants and Lycænid larvæ appears not to exist with regard to Chrysophanid larvæ.

Perhaps the most remarkable family-habit of the larvæ of the "coppers" is the food-habit. True it is that Linné considered that the larva of *Heodes virgaureae* fed on golden-rod and that this has been, and still is, quoted by lepidopterists without personal knowledge of its accuracy or inaccuracy, but one suspects that the original observation was founded on error. In the Saas-Thal the imagines swarm on golden-rod flowers, but the larvæ feed on *Rumex*. Yet one must not forget that Moncreaff records (*Ent.*, iii., p. 41) finding, on December 17th, 1865, a number of larvæ of *Rumicia phlaeas* feeding on "dock" and "ragwort," a record that has not been, we believe, confirmed or denied since so far as "ragwort" is concerned. The only other genuine recorded instance of a Chrysophanid larva not feeding on a Polygonaceous plant is that of the Nearctic *Epidemia epixanthe*, which Cook records (*Can. Ent.*, xl., pp. 85 *et seq.*), as choosing *Vaccinium macrocarpus*. This choice of *Vaccinium* is interesting, see our remarks on the *Vaccinium*-feeding Coliad (preceding volume, pp. 56-7) and Callophryid (pp. 62-3) larvæ. Whether the statement of Linné, that the larva of *Heodes virgaureae* feeds on *Solidago*, or that of Ochsenheimer, that the larva of this species feeds on *Solidago virgaurea* and *Rumex acutus* (*Die Schmett.*, i., pt. 2, p. 86), be correct or not, it is quite certain that the species feeds freely naturally on *Rumex acetosa* (Selzer, *Ent. Record*, xx., pp. 212-213). Rühl notes the food of *Loweia amphidamas* as *Polygonum bistorta*, and not sorrel, as stated by some authors. The Nearctic species, *Chrysophanus gorgon*, feeds on a long-stemmed species of *Eriogonum* that grows on the very dry hillsides of California. Berce and Macker (*teste* Lambillion) give broom and other papilionaceous plants as the food of *Loweia dorilis*, but we doubt these plants as foods greatly, and the records require confirmation.

With hardly an exception, then, the Chrysophanid larvæ appear to be restricted to plants of the natural order, *Polygonaceae*, for food, and the Palæarctic species almost entirely to the genus *Rumex*. Thus *Rumicia phlaeas* is noted as feeding on *Rumex acetosa*, *R. acetosella*, *R. obtusifolius*, *R. pulcher*, *R. crispus*, *R. scutatus* (see *Nat. Hist. Brit. Butts.*, i., pp. 391-2), although many observers insist that, in nature, *R. acetosa* and *R. acetosella*, the acid sorrels, alone are usually selected. Prideaux compares (*Ent. Rec.*, xviii., p. 246) the larva of *Loweia alciphron* (*gordius*) with that of *Rumicia phlaeas* and observes that it, too, feeds on *Rumex acetosa*, an acid species of the genus, *R. acetosella*, being added by Gillmer (*Int. Ent. Zeits.*, ii., p. 65.) *Chrysophanus dispar*, on the other hand, selects the non-acid species—*Rumex hydrolapathum*, *R. obtusifolius*, *R. sanguineus* and *R. aquaticus* being mentioned with certainty, whilst Sich adds that larvæ he was rearing would not touch the leaves of *Rumex acetosa* with which he sometimes supplied them (*Nat. Hist. Brit. Butts.*, i., p. 448); Aigner, however, gives *Polygonum bistorta*. The Nearctic *Chrysophanus thoë* is stated by Scudder (*Butts. New Engl.*, ii., p. 981) to feed also on a non-acid dock, *Rumex crispus*. According to Rühl, the larva of *Chrysophanus hippothoë* feeds on *Rumex acetosa*, but de Joannis notes it as feeding on *R. hydrolapathum*. Prideaux supports Rühl, and observes that the larvæ feed indiscriminately on *R. acetosa* and *R. acetosella*; the food-habit of this species closely resembling that of *Loweia alciphron* var. *gordius*.

The sluggish habits of the larvæ of the Chrysophanids are most marked, and they last throughout larval life. Chapman observes that the larva of *Rumicia phlaeas*, when newly-hatched, is prepared to do some travelling to find a suitable feeding-place, though the eggs are usually so placed as to render this unnecessary; the young larva, however, is noticed to leave its furrow and make a fresh one one or more times, whilst in the first instar, probably because the furrow runs up against a rib or some other difficult or less palatable portion of the leaf. A leaf, with a few larvæ in the first instar, often shows a good number of abandoned furrows. The young larva of *Heodes virgaureae*, whose eggs are laid on dead material, and so remain during the winter, may have to make a considerable journey as soon as hatched, in order to find food. Prideaux states (*Ent. Record*, xviii., p. 246) that the green larvæ of *Loweia alciphron* (*gordius*) are exceedingly sluggish, feeding and resting on the underside of the leaves of *Rumex acetosa*. He observes, however, that, except during the moulting process, the least touch is sufficient to dislodge the larva from its foodplant, and, should it fall upon its back, the leisurely manner in which it twists itself back on its feet characterises its sluggish habits and attitude under all conditions. He further notes that the larvæ of *Chrysophanus hippothoë* are easily dislodged from their foodplant, except when they are fastened up for a moult, when they cling to it rather firmly. This sluggish habit appears to be closely allied to the cryptic habits exhibited by Chrysophanid larvæ. Of that of *Chrysophanus dispar* (*rutilus*) Sich writes (*in litt.*): "The pale green, fullfed, larva of *Chrysophanus dispar* (*rutilus*) adheres closely to the leaf of *Rumex hydrolapathum*, and, from its peculiar shape, casting little shadow, is remarkably well hidden. It is rather yellower than the dock-leaf, and might easily be passed over as a spot of sunlight. Its dermal covering, however, harmonises well with the leaf. Its skin is covered with little white cup-hairs, which, to the unaided eye, look like little white dots, resembling somewhat the white points on the dock leaf, especially numerous about the veins on the underside." *Chrysophanus dispar* larva drops rapidly, like its congeners, from its position of rest on a leaf, if disturbed, but does so by means of a thread-attachment (Sich), not noticed in *L. alciphron* (*gordius*) (*suprà*). Frohawk, contrary to other observers, says (*Ent.*, xl., p. 146) that, when young, "the larvæ of *C. dispar* crawl rapidly," and that "they continually shift their quarters, never remaining to feed in the same place long," but adds that the fullgrown larvæ are "sluggish in their movements, crawling with a slow gliding motion." He further observes the fact that, whilst the summer-feeding larvæ remain green, the autumn-feeding larvæ, when preparing for hybernation, gradually change to a more or less lilac hue, mixed with green stripes, which colour entirely harmonises with the surroundings of the larva when hybernating, the dull lilac and greenish producing a most protective combination of colour that renders the larva very inconspicuous in the dead leaves. After hybernation, and before the first spring moult, they gradually lose the lilac colouring and assume the normal green. Sich notes that he specially observed two larvæ of *C. dispar* (*rutilus*) that moulted into the 3rd instar, August 10th, 1906. These, he noticed, had changed from green to greenish-brown on the 13th, and, on the 14th, were brown with a tint of red on the whole of the upper surface, the legs and the venter remaining green; this part being naturally always hidden, needs no cryptic coloration. Chapman observes that further statistical data are wanted, but there are some grounds for believing that the red colour in the larvæ of *Rumicia phlaeas*, that is so variable in amount and makes some of them so brilliant, is more pronounced and constant in those larvæ that hybernate, young larvæ that are not to hybernate rarely having much of it, and it may be quite wanting in full-grown summer larvæ. In any case, the red colour harmonises with the red colour that is so common in *Rumex acetosa* and *R. acetosella*, when under adverse conditions, of drought, age, injury, etc. When young the larva of *Heodes virgaureae* rests on the lower part of the stalk of a sorrel leaf, when older, on the underside of these leaves, growing slowly in the first four weeks of larval life, but much more rapidly in the last three weeks, being of the same colour as the sorrel leaf, and excellently protected when resting on the underside of the leaves. Grundel observes (*Ent. News*, xv., p. 97) that the young larvæ of *Chrysophanus gorgon*, a Californian species, live on the lower part of the plants, hiding among the old leaves and feeding but very little in the autumn on the upper- or green side of the leaf, which the larvæ resemble in colour, being of a dark green, and eating only during the night and early morning up to about 9 a.m., growing but very slowly and only being $\frac{1}{8}$ in. long by the latter part of October. In spring, however, the larva changes to a fine, furry, light green, nearly white, and exactly resembling the underside of the leaves upon which only it feeds. So sluggish is the larva when removed from the plant that it appears to be lifeless, and will remain so for several hours. Buckler says that the young larva of *Rumicia phlaeas* is sluggish, generally making a little channel on the underside of a leaf just the width of the body, and about its length, so that the larva lies sunk in this channel about on a level with the surface of the leaf, etc. Chapman observes that the habit of the young larva of *Rumicia phlaeas* (and others) in changing to a fresh furrow may be very useful by aiding the larvæ in being inconspicuous. When the larva is in a furrow that it quite fills, the furrow is practically invisible, the larva supplying the place of the lost tissues of the leaf, but when there is an unoccupied portion behind the larva it shows a white spot either from above or below; an abandoned furrow is, therefore, fairly conspicuous. It is an instance of what is so frequently observed in other lepidopterous larvæ, *viz.*, that, whilst the larva is there, it and its devastations are difficult to see, but are obtrusive as soon as the larva has left. Newman observes that, when full-fed, the larvæ rest on the underside of the leaves, closely appressed to the surface, and, when walking, gliding over the surface exactly in the manner of a slug, no separate motion of the body or legs being perceptible. The larva of *Chrysophanus dispar* also has a snail-like crawl, and exhibits, when in motion, a very distinct subspiracular flange, formed of a rather deep longitudinal depression between two outstanding upper and lower elements, the latter of which, on either side, flattens out against the resting-surface, hiding the prolegs and true legs when the larva comes to rest; when crawling, however, the venter is kept very flat against the surface, the motion forward being extremely slow, the larva stretching out its head in an enquiring way when in doubt, etc. Chapman says that the slug-like aspect comes out in several ways, *e.g.*, in the absence of dorsal ridges, the close application of the lateral margin or flanges to the surface on which the larva is crawling, etc. He adds that the larva, if one can regard it as not a slug, but as an emerald with a dewy coating or simply as a caterpillar, is really beautiful. Sich says that the larva is able to move its legs and claspers without disturbing the dorsum, so that it seems rather to glide than to walk; as a matter of fact, it takes very short steps with a continuous motion, and, as all the under-parts are very soft, their movement does not affect any usually visible part of the larva unless it is travelling at an unusual rate of speed. If irritated in front, the larva can retreat backwards.

Prideaux observes (*in litt.*) that the young larvæ of *Chrysophanus hippothoë* burrow into the soft tissue of the leaves of *Rumex acetosa* and *R. acetosella*, leaving behind them a pale track of unconsumed epidermis, with traces of adhering frass, but, later, they readily devour the entire leaf, with the exception of the base of the midrib and stalk. The black head is unseen during feeding, the collar-like prothorax being pressed against the edge of the leaf. He further notes (*Ent. Rec.*, xviii., p. 246) that the young larvæ of *Loweia alci-*

phron (*gordius*) feed on the underside of the leaves of *Rumex acetosa*, making inroads into the green substance, and leaving the upper epidermis intact. Those of *Chrysophanus dispar* live on the underside of the leaves of *Rumex hydrolapathum*, from which they first gnaw off the epidermis, but, as they get older, they eat little holes right through the leaves. When newly-hatched Frohawk observes that the larva of the latter species crawls to the undersurface of the leaf, eats into the cuticle, and lies in the furrow eaten out, with the lateral flange of hairs lying flat on the surface overlapping the edges of the furrow. After making a little channel, often not more than its own length, just to lie in, it moves to another spot, and eats out another groove, and so on to another, so that, after feeding for a few days, several little transparent channels of various lengths are cut in the leaf, which is not perforated, as they leave a thin membrane on the uppersurface. If a portion of the leaf is curled over so as to leave the undersurface uppermost, they then feed on the upper cuticle; they are, therefore, indifferent on which surface they feed, so long as they are underneath. Sich observes that, when quite young, they eat out small patches, consuming the lower cuticle and the parenchyma, but leaving the upper cuticle entire, and, at this time, are most inconspicuous on account of their flatness, pale colour, and translucent aspect; in the third stadium they begin to eat holes right through the leaves, and, in the last stadium, they make large holes, frequently near the midrib, but, though they consume the smaller veins of the leaf, the large lateral veins usually stop them, and often form a margin of a hole. Whilst feeding they keep the edge of the prothorax always close to the surface of the leaves, and the head remains buried in the prothorax. Frohawk also further notes that, in the third stadium, the larvæ perforate the leaf, eating large holes all over it, whilst, in their final stage, they eat voraciously and grow rapidly. Selzer observes that, when newly-hatched, the young larvæ of *Heodes virgaureae* make small, oval, transparent spots on the leaves but are rarely to be observed, for, as soon as they have fed, they hide low down on the stalks; they feed up rapidly, however, and, when about three or four weeks old, devour considerable portions of the leaves, and finally eat the leaf entirely. When quite young the larva of *Rumicia phlaeas* eats little holes, of about its own size, halfway through a leaf from the underside, or makes a channel about the width of the body and about its length, in which it lies sunk, on about a level with the surface of the leaf, extending this later and eating the green cuticle, which is thicker on the underside than the upperside, after a time leaving only the upper epidermis remaining; in their earliest stages they are most difficult to detect. When the larva gets larger it may feed from the side of the leaf and throughout its whole thickness, so that, in its feeding-habits, the larva of this species is much like that of *Chrysophanus dispar*, except that the latter appears very seldom, if ever, to eat from the side of the leaf. Rühl says that, when young, the larva of *Loweia amphidamas* rests on the underside of a leaf of the foodplant, eating at first only the lower parenchyma, but after its last moult attacks the entire leaf.

The development of "forwards" is most marked in *Rumicia phlaeas* in all its broods. Raynor observes that, from eggs laid in early June, 1905, the fastest larvæ commenced to pupate on July 20th, that by July 24th there were eight pupæ, and, of the remaining larvæ, some were fullfed, and others yet quite small. Sabine notes that, of a large number of larvæ reared from August-laid eggs, in 1904, many had pupated by the end of September, and produced imagines in October, whilst, at the same time, the greater part of the remainder, consisting of some hundreds, were only half-fed, or little more, so that one supposes most would hybernate, as is usual, as larvæ, and not attempt to feed up and produce imagines the same autumn. Chapman observed that, on September 3rd, 1906, a small brood of larvæ, from eggs laid a fortnight previously, differed to such an extent that one was in the pupal state, two or three girthed up, six or seven nearly full-grown, whilst the remainder were still small, fond of bunching themselves up almost into little balls, and that they became lethargic on September 12th, eating nothing. The development of "forwards" in *Loweia dorilis* is also very marked; in the south of Europe, almost all the larvæ from the eggs of the spring brood go forward to produce an early summer brood, and these in time to an autumn one; further north, however, and in cold seasons, this forward habit is much more partial. The larvæ resulting from the spring brood of *Loweia amphidamas* also almost all go forward to the production of a late summer brood. None of Prideaux's larvæ of *Loweia alciphron* (*gordius*), in 1905, developed a "forward" habit, but one ceased feeding after the last moult, in May, 1906, shrank somewhat in size, attached itself to the side of its cage, and remained æstivating in this situation for about three months; early in September it again showed signs of activity, recommenced feeding and apparently went on to pupation. Prideaux also notes that, in the summer of 1898, a brood of larvæ from a parent ♀ of *Chrysophanus hippothoë*, taken in early July at Salvan, began to show an inclination to hybernate late in September, although quite small, except two examples which fed on and produced pupæ in the middle of October. Nicholson notes that, in June-July, 1892, larvæ obtained from June-laid eggs of *Chrysophanus dispar*, at Budafok, were brought to England; and the few that were brought through were all of the "forward" type, pupating in late July, imagines being reared during August. Frohawk also obtained eggs from Austrian ♀ s in June, 1906, 413 from three ♀ s; these hatched from June 21st; the larvæ fed rapidly and pupated from July 12th, the average larval life extending only 21 days; the imagines commenced to emerge July 23rd, and, apparently, the whole of the larvæ were "forwards." Frohawk further notes (*Ent.*, xl., p. 177) that, from Colmar ♀ s, he also obtained eggs in mid-August, 1906, proving that here the species is, at least, partially double-brooded. Throughout the southern parts of France, Italy, and the lowlands of the Balkan Peninsula and Asia Minor, the species produces a large percentage of "forwards" and a correspondingly large "second-brood," but, in the Berlin district, Gillmer says that the species is single-brooded, although, in confinement, an occasional second-brood example may be reared. The "forwards" usually feed up very rapidly, and the examples of the second-brood are, in consequence, frequently comparatively small.

Although the larvæ of the summer broods of *Loweia dorilis* go forward with much unanimity, those of the autumn brood hybernate very small from September, until the early warm days of spring, under leaves, etc., whilst, similarly, Rühl observes that the autumn larvæ of *Loweia amphidamas* hybernate when less than half-grown, and commence feeding again in the spring, being fullfed in late April or early May.

There is, however, some variation in the hybernating habit of the Chrysophanids, for, although most hybernate as larvæ, *Heodes virgaureae* passes the winter in the egg-stage, but still as a larva, for the larva is fully-formed in the eggshell, though it does not leave it till spring is well-advanced. Cook found (*Can. Ent.*, xl., pp. 85 *et seq.*) the Nearctic *Epidemia epixanthe* ovipositing at the end of June, 1907, at Lakewood, N.J., on *Vaccinium macrocarpus*, the eggs being laid chiefly on the underside of the leaves; he further notes that the eggs did not hatch till the following spring, the insect hybernating in the egg-stage.

Prideaux notes (*Ent. Rec.*, xviii., p. 246) that a small batch of larvæ of *Loweia alciphron* (*gordius*) commenced to hybernate early in November, 1905, with great unanimity. He further adds (*in litt.*) that the larvæ of *Chrysophanus hippothoë* hybernate just as do those of *L. gordius*, attached to dead sorrel leaves, the larvæ of the two species appearing at this time, and also later, almost indistinguishable to the naked eye, although the pupæ are very different. He says that the larvæ of *C. hippothoë*, in confinement, huddle together on a dead or dying leaf for hybernation in a manner almost suggestive of a gregarious habit, but this is probably owing to a common instinct for finding the driest or most suitable accommodation that the breeding-cage affords. These green larvæ are, he adds, readily seen against a brown leaf, but the latter is usually crumpled and curled round them, thus affording concealment. Some larvæ of *Chrysophanus dispar* (*rutilus*), reared by Sich, hybernated in the third instar, laying up on August 14th, 1906, and remaining quiescent, though from time to time they changed their position; another lot of larvæ which Chapman was rearing commenced to hybernate on August 15th, 1906, each larva spinning a silken pad on which to rest. He observes that one larva sometimes left its pad, wandered for a day or two, and then returned, but, on September 11th, it seemed to have finally settled down for hybernation. These were both of the single-brooded race of the species taken near Berlin. Yet another lot went into hybernation, according to Frohawk, at the beginning of October, 1906; these were from second-brood ♀ s, the eggs having been laid in mid-August on both dock and sorrel, the young larvæ appearing at the end of that month and in early September, thus showing a marked difference between the times at which hybernation commences in "single-brooded" and "double-brooded" areas. He further notes of these that, when examined in December, those larvæ that had hybernated on a living plant of dock (with plenty of green leaves) were dead, whilst others that had hybernated on a plant that had died down and only had brown shrivelled leaves were alive and healthy, hybernating in the folds of the damp dead leaves; on February 27th some were still quiescent and in their hybernating position, others, however, were crawling actively about, and some were already on the undersides of the young freshly-grown leaves. One suspects an error of observation in Frohawk's note (*Ent.*, xl., p. 178), that these larvæ hybernated in the "second" (and not the "third") instar. The Nearctic *Chrysophanus gorgon* hybernates as a small larva, from the end of October, when it is only about one-eighth of an inch in length, commencing to feed again in the spring and being full-fed in early May, thus following closely the usual habits of the larvæ of the Palæarctic species. The larvæ of *Rumicia phlaeas* are said to show some variation in the size of the larvæ in hybernation, for Prideaux observes that the larvæ hybernate at different ages and feed in mild weather, but Buckler says that the third (or fourth) instar is usually the hybernating one, whilst Chapman notes that they appear to hybernate when about 4mm. long and 2mm. thick. It is undoubtedly true that larvæ well-placed feed up very rapidly in the spring, and are fullfed almost before others have thrown off their lethargy. Schneider also asserts that, at Tromsö, the larvæ hybernate at various ages and that this accounts for the long drawn-out period of the flight of the only brood that occurs in the north of Scandinavia. We suspect that largely it is rather a matter of commencing to feed early and feeding up rapidly rather than any difference in the hybernating age.

CHAPTER II.

FAMILY HABITS IN BUTTERFLY LARVÆ—THE URBICOLIDS.

The early stages of the Urbicolids or Skippers are little known, although the broad features of the life-histories of our few British species have been moderately well worked out, as have also those of a certain number of the Palæarctic and Nearctic species; but there are many exotic groups of which practically nothing has been recorded, and our remarks, therefore, refer largely to a comparatively few Palæarctic and Nearctic species, although the number of tropical and subtropical species is very great.

In looking at the larval habits, as we know them, the skippers would appear to divide into two very distinct and widely-separated groups on the food-habit, one very large section being grass-feeders, the other, perhaps even larger, feeders on rosaceous, malvaceous, leguminous, and other low-growing plants belonging to various natural orders. These, so far as our British species are concerned, divide into (1) *Adopaea lineola*, *A. flava*, *Thymelicus acteon*, *Augiades sylvanus*, *Urbicola comma*, and *Cyclopides palaemon*. (2) *Hesperia malvae* and *Nisoniades tages*. It will be seen from this that the grass-feeding larvæ are referable to the Thymelicine, Urbicoline, and Cyclopidine groups, whilst the true Hesperiines affect foodplants of other natural orders. This appears to be also generally true of the Palæarctic and Nearctic species, but our knowledge of the exotic skippers, as far as details of life-history are concerned, do not allow us to judge whether it is true also of these, although there are suggestions that, if not absolute grass-feeders, the Urbicolid section prefers to keep to monocotyledonous plants. Speaking of the general food-habit of the Nearctic Hesperiines, Scudder says (p. 1375): "The caterpillars generally feed upon *Leguminosae*, but also upon a variety of other angiosperms, and live in horizontal nests formed by bending over a portion of a leaf, and fastening it to the rest by distant broad bands of silk, often so long as not to bring the different parts of the leaf in contact, or, later in life, they draw together several leaves in a similar manner." Of the Urbicolines of the Nearctic region, Scudder further observes (*Butts. New England*, ii., p. 1548): "The caterpillars feed almost entirely upon *Gramineae* or allied endogenous plants, and each forms for itself a vertical nest by connecting several blades of the plant it is eating, by a loose, thin, open web of slender threads. I never found any that would not feed on *Gramineae* . . . . and there can be little doubt, that, as a general rule, the caterpillars of this tribe feed on endogenous plants, in contrast with those of the Hesperiines, which certainly prefer *Leguminosae*, and are not known, in a single instance, as far as I recall, to feed in nature on endogenous families."

The greatest irregularity in the food-habit of the "skippers" is to be found in the Nisoniadid group. Our single British species, *Nisoniades tages*, feeds on *Lotus corniculatus*, a leguminous plant, and Scudder, writing of the food-habit of the Nearctic species (placed by him in the genus *Thanaos*), writes (*op. cit.* p. 1452): "The caterpillars feed mostly upon leguminous plants, but not infrequently on *Cupuliferae* and *Salicaceae*, and even on *Ranunculaceae*, *Hamamelaceae*, and *Chenopodiaceae* in this country, and on *Cruciferae* and *Umbelliferae* in Europe, whilst Stoll figures a South American species on a *Solanum*."

Although, as we have noted, the larvæ of the greater number of the Nearctic and Palæarctic Urbicolid (*sens. strict.*) species feed on grasses of various species, the subtropical and tropical species, whilst still maintaining an endogenous pabulum, attack other orders than grass *in sens. strict.*, *e.g.*, the larva of the Carolinian *Lerema accius* feeds on the blades of *Zea mais*, as well as those of *Erianthus alopecuroides*. The larva of *Calpodes ethlius*, a Central American species which extends into the southern United States, feeds on various species of *Canna*, in Cuba, on *Canna indica*, and in the southern States on *Canna flaccida*, etc. The larvæ of the Sumatran species, *Hyarotis adrastus* and *Gangara thyrsis* are stated by de Nicéville to feed on rattan-cane (*Calamus*), whilst that of *Erinota thrax* affects *Musa* (plantain). It is stated that, in 1892, the larvæ of *Hidari irava* did great damage in Sumatra to the cocoa-nut palms, so much so that the foliage of the trees, near the manager's house at Namoe Oekoe, was eaten up by the larvæ; similarly, the larvæ of *Erinota thrax* often occur in large numbers, their ravages giving the plantain-leaves a very torn appearance. One Indian species, *Baracus septentrionum*, feeds on soft long-leaved grasses, whilst another Indian species, *Suastus gremius*, is said by Davidson and Aitken to feed on palms, *Coryota*, *Cocos*, and *Calamus*. The same authors note the larvæ of *Parnara bevani* and *Baoris bada* as feeding on rice (and on grass), and that of *Matapa aria*, on a dwarf species of bamboo. The larva of one Palæarctic species, *Chapra mathias*, that extends into Bombay, has been noted by Aitken as feeding there on grass, whilst the allied *C. agna* affects rice. Atkinson reports the larva of *Telicota bambusae* as feeding on bamboo, and Aitkin and Davidson the larva of *Iambrix salsala*, on coarse grasses as well as bamboo, whilst that of *Halpe moorei* appears confined to the latter.

We have already quoted (*anteà*, p. 8) Scudder's general remarks on the food-habit of the Nearctic Hesperiines. Of some of the species, considerable detail of the larval food-habits has been observed. Comstock states that the larvæ of the almost subtropical species, *Eudamus proteus*, feeds not only on a variety of leguminous plants, but also does damage in Florida to the crops of turnips and cabbage. The larva of *Epargyreus tityrus* feeds on so large a number of leguminous plants, that Scudder thinks it would possibly refuse nothing belonging to this natural order. The larva of the allied *Achalarus lycidas* also chooses *Leguminosae* for its foodplants (although other plants have been very dubiously suggested as possible foods). The larvæ of *Thorybes bathyllus* and *T. pylades* are leguminous feeders, both species appearing to be confined entirely to plants of this natural order.

Whilst, therefore, the food-habit appears to be fairly well-defined as between the larger groups, the feeding-period seems to be varied and uncertain. We cannot class the larvæ as a whole as summer-feeding, nor as over-wintering (feeding in autumn and again in spring). Even a detailed consideration of the feeding-period in our few British species shows considerable variation in this direction, and suggests a division roughly into tribal sections rather than any general superfamily character, a division apparently to be noticed in the species of a tribe scattered over a large geographical area, and subjected to great differences in climatic conditions, rather than in the habits of more distantly related species, occupying similar areas under similar climatic conditions, or even the same ground. This generalisation, however, cannot be pushed far, as illustrated by the differences in the allied *Adopaea lineola* and *A. flava*, and still more markedly in *Urbicola comma* and *Augiades sylvanus*.

To illustrate the variability existing in this respect it may be noted that the Thymelicines are essentially spring-feeding larvæ. Of our three British species, *Adopaea lineola* hybernates as egg (the fully-formed larva contained within the egg all the winter), *Thymelicus acteon* almost certainly has the same habit, whilst *Adopaea flava*, although hatching in the late summer (*teste* Buckler), does very little feeding before hybernation, and commences its winter rest when not more than 2mm. in length. The actual feeding-period of all these larvæ, however, practically lasts from March to June, whilst their habits of living in tubes formed of grass-blades, of resting by day and feeding chiefly by night, are almost identical. Our two Urbicolid species, however, are very different. *Urbicola comma*, like some of the Thymelicines, hybernates as a fully-formed larva inside the egg, hatches in early spring, feeds like them until June (or early July), makes a tubular dwelling of grass-blades (but of larger size), and pupates and emerges rather later than they. The closely-allied *Augiades sylvanus*, however, commences its larval life in July and August, feeds on into its fourth instar, and does not hybernate until it is some 13mm. in length. By April 20th, 1903, the larva of *Erynnis lavatherae* (a species belonging to the opposite branch of the Urbicolid stirps) was found in the Val Verzasca, in its penultimate skin, feeding in a leafy nest on *Stachys recta* (*Ent. Rec.*, xv., p. 298), so that it would seem to have a similar larval feeding-period to that of *A. sylvanus*. The knowledge derived from the feeding-periods of *Nisoniades tages* and *Hesperia malvae* (on the same side of the Urbicolid stirps as *E. lavatherae*) made this observation unexpected, for both these species have strictly summer-feeding larvæ, the larvæ of both species feeding from June to September, and then hybernating—*N. tages* as a fullfed larvæ that pupates in spring, *H. malvae* as pupa (the pupal stage being assumed in August and September). As showing the peculiar similarities in the feeding-period in distant species, the larva of *Cyclopides palaemon*, belonging to an entirely different branch of the "skippers" from that claiming *Nisoniades tages*, has an absolutely similar summer-feeding larval period, *viz.*, from June to September, and then, like the latter, hybernates as a full-fed larva.

We have already noted (*suprà*) that the feeding-period of the larva of *Erynnis lavatherae* extends over autumn and spring, yet the larva of the allied *E. althaeae* and *E. alceae* are reported by the authorities to be purely summer-feeding larvæ, hybernating full-fed, and pupating in the spring without further feeding. The larva of *Powellia sao* is also said to have this Nisoniadid habit, as well as the larva of *Hesperia serratulae*. The larva of *Bremeria maculatus* is said to have a comparatively short summer feeding-period, and, like that of *Hesperia malvae*, to pupate in the autumn. *Muschampia proto* and *Hesperia carthami* are both reported to have over-wintering larvæ, but in what stage hybernation occurs is not recorded; on the other hand, *Hesperia alveus* is said to hybernate as egg, quite unlike any of the closely-allied species, and hence to have a spring and early summer feeding-period. Our knowledge, however, of these species is most unsatisfactory, and Chapman observes (*in litt.*) that the larvæ of *M. proto* are so very small in the early spring, at Taormina, in Sicily, that it almost suggests that the species winters as an egg.

Practically nothing reliable appears to have been recorded of the feeding-period of the Urbicolid larvæ outside Europe. Scudder notes that the Nearctic *Anthomaster leonardus* appears to hybernate as a newly-hatched larva, that *Atrytone zabulon* passes the winter sometimes as a mature larva and sometimes as a pupa, a very unlikely suggestion, although the evidence is sufficient to suggest a summer feeding-period for the larva of this species. These few uncertain statements are all that have come under our notice on the feeding-period of the extra-European larvæ of this group.

One larval habit, however, appears very general throughout the superfamily, *viz.*, the making of a hiding-place of drawn-together leaves, in which the larvæ secrete themselves by day and from which, wholly or partially, they come out to feed by night. The habit is quite independent of foodplant, habitat, or age of larva. The young larva of *Adopaea lineola* is said, in April, to take up a position in the middle of a grass-blade, to draw the blade together by spinning silken threads over the back, and enlarging its home with its growth; in this it lives by day, retreating backwards down the tube if disturbed, but being found outside near the top of the grass-blade at dusk. The larva of *Thymelicus acteon* also rolls a grass-blade into a cylindrical tube, open at both ends, fastening the edges of the blade together by stout white silken threads, but, as it increases in size, using two neighbouring blades, fastened along their edges, instead of one: in this retreat it rests by day along the flat surface of the leaf, and leaves it at night to feed on the upper part of the blades. Although the larva of *Adopaea flava* leaves the egg in August, it adopts a similar habit, spinning, as soon as hatched, little web-coverings for itself on a grass-blade, whilst, after hybernation, it makes a longish tube, coming out in the evening to feed. The larva of *Augiades sylvanus*, as soon as hatched, takes up a position in the middle of a young grass-blade, fastens the edges across with white silk, spinning together, as it gets bigger, the edges of a larger blade, making an opaque web, not much larger than itself for a hiding-place, and, towards the end of October, converts it into a long, close-fitting, tough, silken hybernaculum; after hybernation the larva spins larger and longer tubes, and hides therein until full-fed. The larva of *Urbicola comma*, when it leaves the egg, in late March or early April, spins the fine grass together into a somewhat dense cluster an inch or two above the ground, living in this shelter and feeding upon the grass surrounding it; in this it remains, almost always completely hidden, passing its whole larval life thus concealed, crawling rapidly either backwards or forwards, putting its head only out of the tube to feed on the surrounding blades, feeding with great speed, and retreating rapidly when disturbed ; it appears to be particularly nocturnal in its feeding-habits. The young larvæ of *Cyclopides palaemon*, from the very first, makes a little tubular dwelling by drawing together the edges of a grass-blade with silk, but, as the larva gets older, the tubes become less perfect, and, finally, the larva is content to lie exposed on the underside of a leaf. Fletcher notes (*Can. Ent.*, xxi., p. 113) that the larva of *C. mandan*, the American form of *C. palaemon*, has precisely similar habits, and, at no time does it construct a tent by catching several leaves together, as do the larvæ of *Urbicola mystic*, *U. cernes*, and *U. manitoba* (the last named a Nearctic form of *U. comma*) ; he says that, in Canada, *C. mandan* prefers the broad-leaved species of grass, a probable instinctive preference for protection, both from the body-shape and coloration, the habit of the larva of lying extended down the midrib with the body closely appressed, the lower part of the head protruded, and the apex drawn back, making the larva well hidden from observation.

Of other Nearctic species, whose larvæ make their hiding-places in or of grass-blades, Scudder gives (*Butts. New England*, ii., pp. 1561 *et seq.*) many interesting observations. He observes that the caterpillar of *Ancyloxipha numitor*, when first hatched, constructs a nest for itself on either side of a blade of grass by fastening together the opposite edges with from five to twelve strong bands of silk, the threads of each band crossing one another, thus making the bands broader at their origin than in the middle; after the first moult the tube in which the larva lives is perfected by the interstices being closed with a thin irregular web of silk. The young larva of *Amblyscirtes vialis* draws about half-way together the opposite sides of a blade of *Poa pratensis* near the top, with one strong strand of silk, thus making a sort of tent; later it fastens together the opposite edges of a blade of grass by about a dozen strands of silk, tightening these until a sort of closed tube is formed; later in life, and especially when about to moult and desiring greater concealment, it constructs a nest by doubling a leaf back upon itself and sewing the sides together, or by stitching together three or four contiguous blades into a tube, lining the floor in either case with a dense coating of silk; when more than half-grown it not infrequently comes out of its nest, and, after the flocculent covering, which distinguishes the larva in its last stages, has fairly developed, it will rest stretched out at full length on a blade of grass, its head thrown back so that its face is dorsal. The caterpillar of *Atrytone zabulon* feeds upon common grasses, drawing portions of leaves together with silken threads, forming a rude case, in which it secretes itself; when placed on a strong ribbed blade, the edges of which it cannot bend, it spins a few threads from rib to rib, and places itself behind the threads. This latter action is performed by carrying a thread repeatedly between the same points, each thread being drawn tightly and made a little shorter than the previous one, until the edges are brought so near together that the larva has barely room to withdraw its head . . . . one of the little strands is composed of 20 or 30 threads. The larva of *Urbicola sassacus* is sluggish throughout its whole life, living apparently between the leaves of grass, close down to their union with the stem, and using the crevice for a nest, apparently without any silken fastenings; its habits are said to be not specially cleanly, as is the case in most other "skipper" larvæ, for it soils its nest considerably; this habit of living closely down by the roots reminds one much of Staudinger's remarks on the habits of the larva of *Urbicola comma* (*anteà*, viii., pp. 175-176). The caterpillar of *Atalopedes huron* feeds on *Cynodon dactylon* and other grasses, fastening together a number of blades, lining the cylindrical cavity thus formed with a silken web, and, living within this retreat, comes out only to feed. The larva of *Thymelicus brettus* draws together the leaves of the grass, *Paspalum ciliatifolium*, on which it feeds, lining the cavity, in which it rests concealed when not feeding, with silk, and within which it moults; its feeding is done mostly by night. The larva of the allied *T. mystic* is said to be timid, retiring abruptly, at the least alarm, into its firmly constructed tubular nest of many grass-blades, so lined with silk that any openings between the grass-blades are covered with a gauze-like framework, somewhat resembling that of the cocoon of the Geometrid moth, *Zerene catenaria*. The caterpillars of the *Lamochores* species construct a feeble gauze-like tubular nest, between grass-blades, in which they hide when not feeding, their habits being very similar to those of the species of *Atrytone* (*suprà*). The larvæ of *Lamochores mantaaqua* feed on ordinary grasses, their tubular nests loosely-constructed of grass-blades, in which, however, all the lateral slits are kept from opening by numerous connecting threads between the blades; the larva of *L. taumas* also feeds upon common grasses (apparently only by day), and is apparently an indolent, yet timorous, creature, retiring at the least alarm, curling up, if disturbed, when out of its nest, but rarely leaving it, living always close to it, and eating the driest blades rather than go the least distance for fresh material. The larva of *Calpodes ethlius* folds over a small portion of *Canna* leaf, and fixes it in position by a few stitches of silk, enlarging this temporary retreat, or folding a new section as it grows; it feeds from this tubular case just along the edges of the leaf, retreating within the nest when alarmed. Dodge observes that larvæ he reared in confinement curled the leaves just enough to form a convenient hiding-place, although not confining themselves exclusively to it, since he noticed that, more than once, the larvæ were observed stretched out at full length on the foliage, or even on the sides of the box.

Aitken observes (*Journ. Bomb. Nat. Hist. Soc.*, ii., p. 42) that the larva of *Chapra mathias* feeds, in India, on a common grass, stitching the edges of a leaf together so as to form a tube, in which it hides by day, coming out only to feed at night; the larva of the allied *C. agna* is said to have exactly the same habit on rice. The same author (*op. cit.*, v., p. 370) notes that the larva of *Parnara bevani* forms a tubular cell of a grass- or rice-blade, on the edges of which it feeds, never leaving its retreat, but pupating therein; whilst the larva of *Matapa aria* forms a cell by rolling spirally a leaf of bamboo. Of the nest-making habits of the larvæ of other exotic Urbicolines, whose pabulum consists of the leaves of other endogenous plants, little is known. Nicéville notes that, in Sumatra, the larva of *Erinota thrax* lives in a shelter made of a portion of a rolled-up leaf of *Musa* (plantain), cultivated or wild; to make this shelter it has to cut into the edge of one of the enormous leaves to obtain a segment to be rolled up; whilst the larva of *Hidari irava* spins two leaves of the cocoa-nut palm together, and lives in the retreat thus made. Davidson and Aitken record (*Journ. Bom. Nat. Hist. Soc.*, v., p. 369) that the larva of *Suastus gremius*, like that of *Gangara thyrsis*, forms a tubular cell by joining the edges of a leaf of the cocoa-nut palm, living within it and never leaving it. The same authors observe (*op. cit.*, vol. xi.) that the larva of *Iambrix salsala* makes at first a loose cell in a leaf of grass or bamboo, but later tightens it by drawing the edges of the leaf together longitudinally. The larva of *Halpe moorei* also makes a cylindrical and tightly-closed cell in a leaf in bamboo, but, in its last stage, the cell is altered, being now formed by doubling the leaf transversely across the middle, bringing the apex up to the stalk and joining the edges loosely with silk. The larva of *Baoris bada* makes an extremely tight cylindrical cell of several blades of rice, lining the inside so tightly with silk that it is very difficult to tear open. Trimen notes the larva of the South African species, *Pamphila dysmephila*, as drawing the leaves of the wild dwarf date-palm (*Phoenix reclinata*) together, and forming an incomplete, silk-lined, tube, sometimes six or seven inches in length.

Different as are the Hesperiines from the Urbicolines in the food-habit, the larvæ have very similar methods of making their hiding-places. Scudder, in his "Excursus" on "Nests and other structures made by Caterpillars," says (*Butts. New Engl.*, p. 1455) that "the larvæ of all the *Hesperidi*, in early life, and by many of them throughout life, make a nest by folding over a little piece of leaf, and fastening the edge to the opposite surface by a few loose strands of silk; to effect this, they first bite a little channel into the leaf, at just such a place as to leave a fragment of leaf, neither too large nor too small to serve as a roof, when they shall have turned it over; often they have to cut two channels in order to procure a flap sufficiently small for their purposes; and it is curious to watch one of these tender creatures, just as soon as it has devoured its eggshell, struggling with a tough oak-leaf, to build for itself a house. These nests are very firmly made, the silken fastenings being composed of many strands, often very tough. On leaving one nest to construct a larger, the caterpillar always, I believe, first bites off the threads of the old nest, and gives the flap a chance to resume its position, which, however, it rarely fully does. When older, many of these same skippers find a single leaf of their foodplant too small to conceal them, and so they draw several leaves together, just as they grow upon the plant, and, retaining them in the desired place by silken bands, live within the leafy bower."

The nest-making of the Hesperiines is well-illustrated by those constructed by our two common British species *Hesperia malvae* and *Nisoniades tages.* The young larva of *Hesperia malvae* chooses the upper-surface of a small leaf of bramble, strawberry, potentilla, etc., settles itself along the midrib, spins several silken threads overhead for a covering under which it feeds ; as it grows larger, still choosing the upper-surface of a leaf for its standpoint, it forms its covering by drawing down another leaf over it, fastening the edges with stout threads, leaving this cave when it gets older to feed on the leaves near. These larval homes are not difficult to find on stunted bramble-bushes with small leaves, the large juicy leaves of strong bushes apparently offering little or no temptation. Sich describes most carefully the tent-making in confinement from strawberry leaves (*anteà*, vol. viii., p. 232). The larvæ of our only Nisoniadid, *Nisoniades tages*, make very different-looking tents. Low down on the leaves of *Lotus corniculatus*, the young larva forms little caves by drawing together three leaflets, with glistening threads, the two outer leaflets being drawn almost close together, and the middle one bent over them like a curved roof, so that the cave passes easily for a not quite expanded leaf. When needed, the old case is abandoned and a new one made ; sometimes several small leaves are involved, the inside being lined with a close carpet of silk, the part (ceiling or floor) used as a platform being especially thickly woven ; at this time the tent looks more like a little ball of leaflets.

Little is known of the hiding-habits of the larvæ of the European Hesperiines. The larva of *Erynnis lavatherae*, when of good size in the spring, forms a little nest of partially-eaten leaves of *Stachys recta*, held together by a few strong cables of silk, a sort of loose cocoon, and, in confinement, always made a fresh one when new food was provided, although the old one was never interfered with. The larva of *Erynnis alceae* is said to live in a rolled leaf of *Malva sylvestris* or *Althaea rosea*, and that of *E. althaeae* in a similar tube made of an *Althaea* leaf, or one of *Marrubium*. The larva of *Hesperia carthami* also makes nests of the leaves of *Althaea officinalis* and *Malva sylvestris*, that of *H. alveus* of the leaves of *Potentilla cinerea*, of *H. serratulae* of those of *Potentilla incana*, that of *Bremeria maculatus* in leaves of *Rubus idaeus* or *Spiraea. Powellia sao* also turns under the margins of the leaves of *Rubus idaeus*, *Potentilla verna*, or *Sanguisorba minor*, whilst *Muschampia proto* spins together the leaves of *Phlomis fructicosa.* The habit, therefore, is quite general in our Palæarctic Hesperiines.

Of the hiding-places made by the Nearctic species, it is reported that the larva of *Eudamus proteus* makes its nest by cutting a slit into a leaf of one of its many leguminous foodplants from the edge, and rolls the flap thus formed around its body, working from the inside of this roll, with its soft parts perfectly protected (Comstock). Scudder observes that the young larva of *Epargyreus tityrus* constructs its nest by nearly severing from one side of a leaf of one of its leguminous food-plants, a small roundish piece, and folding it over, so that the undersurface of the fragment is uppermost, this roof being kept in place by long silken strands attached to the edges of the fragment, and the surface of the leaf beyond, in such a way as to arch the roof like a dome. When older, it attaches two leaves in a similar manner, fluting the edges by attaching to them silken cords at short distances, so as to dome the upper leaf considerably. Harris calls the nest a leafy case to shelter "the larva from the weather, and screen it from the prying eyes of birds, and although there may be, and often are, many caterpillars on the same tree and branch, yet they all live separately within their own cases. One end of the leafy case is left open, and from this the insect comes forth to feed." . The larva of the allied *Achalarus lycidas* selects a place where one leaf of *Desmodium* covers another and stitches them together for a most innocent-looking nest, which disturbs the natural arrangement of the leaves in the least degree; it prefers at first the elevated place near the summit of the *Desmodium*, but, later, requires the larger leaves below, repeatedly changing its home, quitting it as soon as it becomes too restricted, and partially destroying it, Scudder asserts, by cutting most of the threads, giving it the appearance of having been torn open, and the occupant made away with. The young larva of *Thorybes pylades* bites two narrow, parallel, generally somewhat arcuate, slits, about 6mm. apart, near the middle of one side of a leaf of clover or *Lespedeza*, bending over the piece thus partially detached, and attaching it by silken cords to the upper surface, the caterpillar crawling within, and being thus secure from observation: later, the larval nest is constructed somewhat similarly to that of *Epargyreus tityrus*. Miss Murtfeld says that the larva of *Pholisora catullus* makes its earliest case by cutting out and folding over and fastening down a small portion of the edge of a leaf of *Chenopodium album*, forsaking this for another as it gets larger, and finally concealing itself in a home formed from a leaf folded along the midrib, the edges fastened together by a few strong stitches of white silk from a quarter to half-an-inch apart.

We have already noted the nest-making of *Nisoniades tages*. The nest-making habit of its allies in the Nearctic region appears to be similar. Scudder says that the Nisoniadid larvæ "live isolated in little nests which are made upon the underside of leaves, either by cutting and folding over a fragment of the leaf and fastening it securely to the other portion by strong distant bands of silk, or by uniting several leaves." None of the larvæ of the North American species of which information is obtainable, however, feed on *Leguminosae*, as does our *Nisoniades tages*. Lintner describes in detail the shelters of *Thanaos lucilius*, which he found on the undersurface of the leaves of *Aquilegia canadensis*, and which are made in a very ingenious manner. The young larva of this species cuts a narrow channel in the leaf from the margin inwardly a short distance; this completed, a second channel is cut, commencing at another point on the margin not far removed from the first, and almost parallel with it for a short distance, and then curving towards the former until the two almost meet; on this almost separated piece the larva stands, and its weight carries the cut piece down, and, when the desired position is reached, almost in contact with the lower side of the leaf, it is fastened there by threads passing between the two surfaces at several points, the larva living in the space between the two surfaces. Sometimes, as if with the object of economising time and labour, the lobe of a leaf is selected of which to construct this shelter, when but a moderate amount of cutting at its base gives the requisite size and desired form.

As the larva grows it changes its shelter, making at each side a larger one, until, at last, it folds over an entire leaf, or brings two or more leaves together, so as to make a sufficiently large hiding-place. Scudder asserts that, "on leaving one abode to construct a new one, the larva always bites away the strands which have kept the flap securely in place, which then parts a little more widely from the leaf, and often regains a position at right angles to it." The very young larva of the allied *Thanaos persius* constructs a nest by folding a flap of a leaf of willow or poplar over upon the underside, although, later, it folds it invariably upon the upperside; the nest appears to be made always near the middle of a leaf near the midrib, includes no part of the edge, is usually oval in outline (at first not more than 5mm. in diameter, but double in the next stage), the edges attached by pretty long and distant shrouds to the surface of the leaf and the midrib. Tho young larva of *Thanaos juvenalis* constructs its retreat by folding a piece of leaf of oak or hazel downwards, and fastening it in the desired place by long strands of golden-coloured silk, very strongly attached at the extremities; occasionally, however, the piece of leaf is folded upwards, and is then much more conspicuous; openings are left at the side, and, where the edges of the leaf do not quite touch, the space is filled in with a network of delicate tissue-like silk of the same colour. Riley observed in one case that a larva had fastened a lobe of one leaf to another leaf just below it, and so formed a retreat, the attachment being made by stout cords of yellowish silk, the bases of the cords being broader to give them greater strength.

Of the nest-making of the Indian Hesperiines, Davidson and Aitken give (*Journ. Bomb. Nat. Hist. Soc.*, v., p. 370) some interesting details. The larva of *Tagiades atticus* cuts out an oval piece from a leaf of *Dioscorea*, with the margin deeply toothed or scalloped; this is left attached by a narrow neck, including one of the principal veins of the leaf, and bent over so as to form a cell with open archways all round. The larva of *Celaenorrhinus fuscum* lives on the upperside of a leaf of *Strobilanthus*, cutting off and turning over a portion to serve as a roof, that of *C. leucocera* makes its hiding-place of a leaf of *Eranthemum*, but does not scallop the edge of its cell. The young larva of *Badamia exclamationis* makes a tight cylindrical cell at the edge of a leaf of *Combretum extensum*, and, when fullgrown, a retreat very like that constructed by *Hasora chabrona*. The nest-making habits of others are described (*op. cit.*, xi., pp. 22 *et seq.*) by the same observers, *e.g.*, the larva of *Hesperia galba* doubles over a part of a leaf of *Waltheria indica*, a little straggling ground weed, fastening down the edges of the cell thus formed, and lining the inside strongly with silk. The larva of *Caprona ransonnetii* makes its cell by cutting a circular piece out of a leaf of *Helicteres isora*, leaving this piece attached by a hinge, turning it over upon the top of the leaf, where it is fixed down by silk, and strongly lined inside with the same material, the piece soon withering to a brown colour; when nearly fullfed the cell is made by turning a large piece from the edge over to the underside, and fixing it there loosely with silk, the larva resting on the roof of the cell with its back towards the ground. The habit of the young larva of *Coladenia tissa* is similar to those of the last two species, but, in the manner of making its cell, it differs, cutting right across a leaf from edge to edge, about the middle, and at right angles to the midrib, which is also partly bitten through, so that the piece thus separated dies and withers; one side of the part so separated is turned over upon the top of the other, and diagonally across it, the cell being thickly lined with silk so that it is difficult to tear it, whilst an aperture is left in front where the midrib has been gnawed through. Mathew states (*Trans. Ent. Soc. Lond.*, 1888, p. 82) that, in September, 1884, he discovered the larval nests of *Netroçoryne repanda* near Sydney, each composed of a leaf of *Eugenia* doubled over upon itself, and the edges brought together until it formed a completely sheltered tent, having a round opening, evidently gnawed afterwards, facing the stalk, which was strongly fastened with silk to the branch. The leaves forming these nests had perished and turned to bright reddish-brown, and so were conspicuous objects among the green leaves of the tree. The larvæ were small, but larger ones were found in October in similar tents. The small larvæ of the large Australian *Trapezites symmomus* spin little white silken shelters in the concave side of a *Cladium* leaf about halfway down the stem, but the larger ones (found at the same time) hide by day low down amongst the stems of the plant, almost at the roots. Trimen notes (*South African Butts.*, iii., p. 260) that the larva of *Hesperia forestan* feeds on *Robinia pseudacacia*, fastening the pinnæ of a leaf together with silk and feeding in the shelter thus formed. It is difficult to surmise what useful purpose is served by the larvæ making, in some cases, as described above, their hiding-places conspicuous, by biting off a piece of leaf and allowing the dead brown part to point out, as it were, the whereabouts of the larva.

The cleanly habits of the larvæ of our British "skippers" must be known to almost every young lepidopterist. Our own observations on this subject were made many years ago on the cleanliness exhibited in the rolled grass tubes used as hiding-places by *Adopaea flava*, and in the little tented homes made of *Lotus* leaves by the larvæ of *Nisoniades tages*. Since then similar observations have been made on the larvæ of *Cyclopides palaemon*, the only doubtful species in this respect being *Urbicola comma*, whose cleanly habits are somewhat in question. The habit of shooting the pellets of excrement to a distance by some species is also well known, as it occurs in many different superfamilies of the lepidoptera. As already noted (*Nat. Hist. Brit. Lep.*, i., pp. 40-41), the operation is performed by the larvæ of certain moths by means of the "infra-anal lobe" and the "paranal forks," the latter specially well-developed in Cerurids, etc., but these structures appear to be absent in butterfly larvæ, the excrement being thrown away by the "anal comb," which is, however, possibly homologous with the paranal forks. The anal comb of the larva of *Thymelicus acteon* has been already excellently illustrated in this work (*anteà*, vol. viii., pl. xviii.). Sich has observed that the larvæ of *Nisoniades tages* keep their tents beautifully clean, shooting their excrement far away; one larva noticed doing this, shot the pellet on to a window-pane thirteen inches away with such force that the pellet rebounded some inches; the pellets always seemed to be dry when excreted, and are caught on the teeth of the anal comb preparatory to being shot off. Frohawk notes that the larva of *Cyclopides palaemon* has the power of casting its excrement sideways with considerable force, sending it a foot or more, undoubtedly in order to prevent it fouling its domicile. Scudder and other authors note the usual cleanliness of the Urbicolid larvæ in their leafy homes. Thus Harris notes that "the larvæ of *Epargyreus tityrus* are cleanly in their habits, make no dirt in their habitations, but throw it out with a sudden jerk so that it shall fall to a considerable distance—often several yards." Of the larva of *Thorybes pylades*, Scudder remarks that it is as cleanly in its habits as that of *E. tityrus*, always retreating a few steps to the edge of its abode, and, elevating the terminal segment slightly, snapping away its ejectamenta. Of the larvæ of the Nearctic Nisoniadid species, the same author says that their nests are kept scrupulously clean, whilst Edwards observes that the larvæ of *Pholisora catullus* are perfectly neat in their cases, the frass being always expelled or voided outside. The larva of *Atrytone zabulon* also invariably leaves its nest to expel its excrement, whilst the larva of *Calpodes ethlius* is reported to forcibly eject all excrement, as well as all exuviæ from the upper free end of its tubular case. As opposed in character to this general habit of cleanliness usually observed in the Urbicolid larvæ, it may be noted that the larva of *Urbicola sassacus* is reported not to be at all cleanly in its habits, but to soil its hiding-place considerably.

The Urbicolid larvæ have been generally described as most lethargic in their habits and movements, and to a certain extent this is, perhaps, true; there are, however, certainly some general exceptions to this rule, and many of the larvæ retreat or advance rapidly into or from their hiding-places if disturbed. Thus the general habits of the larvæ of *Adopaea lineola* and *A. flava* may be said to be quite lethargic, but the larvæ are able to move up and down the grass-tubes in which they live with considerable rapidity. These larvæ rarely do more than leave their nests by night to feed, remaining quite hidden therein during the day, and their movements are, unless they are disturbed, exceedingly slow and deliberate. The movements of the larva of *Augiades sylvanus* are also extremely sluggish, and it crawls exceedingly slowly from one point to another; Hellins observes that the larvæ of this species appear to be much more lethargic than those of *Urbicola comma*. Frohawk notes that the larvæ of *U. comma* crawl rapidly either forwards or backwards, and that, if disturbed when crawling, the larva frequently wriggles backwards very rapidly, similarly to the habit of wriggling possessed by many micro larvæ. Staudinger also observes that the larvæ of *U. comma* retreated very rapidly into their tubes when an attempt was made to capture them, and further remarks that "the larva is only apparently lazy, for, before its final metamorphosis, or earlier if taken out of its tube, as well as in nature when feeding, its movements are remarkably rapid." The larva of *Cyclopides palaemon* is also active when disturbed, and, at the slightest touch, will run rapidly out of its tube either backwards or forwards, and, after remaining quite still for a time (sometimes as long as an hour), until all apparent danger has passed, it retreats into its abode; its natural movements, however, are very slow. Of our British Hesperiines, the larva of *Hesperia malvae* is very sluggish, and the larva rests in its tent for hours at a stretch, with its head curled round sideways towards its tail. The larvæ of *Nisoniades tages* are even more sluggish, for they rarely leave their domiciles completely, even to feed.

Of the sluggishness of the larvæ of the Nearctic Urbicolids, a good deal has been written. Scudder says that "they are slow in their every movement; it generally takes them nearly a day to eat their way out of their egg-shells, and they appear to spend the major part of their lives within their nests, resting feet upwards, when they are horizontal, as if longing for the time when they could sleep the pupal sleep in that position." As presenting an ideal of lethargy, Miss King records (*Psyche*, iii., p. 323) that, at times, when the larva of *Calpodes ethlius* is undisturbed, there seems to be an almost total suspension of motion in the spiracles, and in all the parts affected by them. The caterpillar of *Thanaos lucilius* is noted as eating its way out of the egg in the most deliberate manner, 24 hours being not uncommonly taken for this alone. Lintner states that the larva of this species takes up a position inside its nest and never moves therefrom except during the brief time that is necessary to take its food from some neighbouring leaf, then its rapid feeding soon satisfies its appetite, and it moves quickly back and resumes its former position. The larva of *T. persius* is also stated to rest in its abode back downward, rarely, if ever, venturing from its home except at night; whilst that of *T. juvenalis* is said to rest generally by day upon the upper surface of its abode, and only to move during the night. The caterpillar of *Amblyscirtes vialis* is stated, in the latter part of its life, to be exceedingly sluggish; it is reputed to take some 70 days to come to maturity in this stage. The palm for slowness in eating its way out of the egg should, perhaps, be awarded to the larva of *Atrytone zabulon*, which has been recorded as taking four days; the full-grown larva of this species, too, is most lethargic, all its movements being extremely deliberate; it remains in its nest the whole of the day, and only leaves it by night. The larva of *Urbicola sassacus* is also very sluggish throughout its life, and Scudder's description of the escape of the larva of *U. attalus* from the egg, presents a marvel of slow and deliberate movement. The larva of *Limochores taumas* is described as an indolent yet timorous creature, retiring at the least disturbance, curling up if discovered outside its nest, which, however, it rarely leaves, feeding always close to it, and even eating the driest blades rather than go the least distance for fresher material, and is still more lethargic just before its pupation in the autumn; indeed, it is a most passive creature throughout life. Some of the Urbicolid larvæ, of course, do move more quickly if disturbed; thus Edwards notes that a larva of *Pholisora catullus*, that was surprised feeding outside its nest by day, retreated hastily into its case tail foremost, when he opened the box in which it was kept. The larva of *Polites peckius*, too, is reported to lead a gipsy life, wandering incessantly from its youth up, chafing at confinement, making little use of the loose nests that it constructs, is alarmed at the least motion, starting suddenly back into its nest with a movement quite unlike that of any other species of the Pamphilids, and not venturing forth again for some time. The larva of *Thymelicus mystic*, reputed to be generally as lethargic as the rest of the "skipper" caterpillars, is said also to be timid, and to retire quickly and abruptly into its tubular nest at the least alarm. The habit of the larva of the Indian *Taractrocera ceramas* when feeding, is said to be, to wander somewhat, and Aitken and Davidson state that, if it is disturbed in its retreat, it will run out and fall to the ground, where it will curl up, a most unusual habit for an Urbicolid larva.

Besides the protection gained by the lethargic habit of the larvæ, coupled with that of living hidden within leafy tents, certain of the larvæ have been noticed as adopting movements which are supposed to have a further protective value, and have been variously assumed as the result of a timorous disposition on the part of some observers, and of fearlessness by others. Thus Sich observed that when he touched the claspers of the larvæ of *Nisoniades tages* with a camel-hair brush, they bit savagely at it; similarly, the larva of *Epargyreus tityrus*, when disturbed, moves its head from side to side, with spasmodic starts, its black jaws wide open, and snapping at everything brought into contact with them. Riley says that the larva of *Thanaos juvenalis*, if touched on the abdomen, turns round and endeavours to bite the intruder, and it is only with the greatest difficulty that one can remove the larva from its tent without injuring the cords, on account of the resistance of the caterpillar; similarly, when alarmed, the larva of *T. lucilius* opens its jaws very widely, whilst Aitken and Davidson say that the larva of the Indian *Tagiades atticus*, if disturbed, will rush at intruders with its black jaws widely extended. They also add that the larva of *Celaenorrhinus fuscum* is fierce and repels intrusion. The fullfed larva of *Eudamus proteus*, when disturbed, spits out a greenish watery fluid, which it scatters about as it jerks its head from side to side; that of *Thorybes pylades*, both when eating and moving about, shakes its head to and fro with a tremulous motion, whilst, when the larva of *Polites peckius* walks, its head trembles from side to side, as if the creature were affected with the palsy.

In an earlier volume (*anteà*, viii., pp. 86-7) we have noted in the larvæ of most Urbicolines (*sens. strict.*) the presence of two snow-white scaly excrescences which gradually develop beneath the epidermis on the underside of the 7th and 8th abdominal segments, during the growth of the larva in its last instars, and are usually mature, so to speak, when the larva is ready for pupation, sometimes apparently before this time. They are really pockets of some waxy matter or asbestos-like material which the larva usually scatters when spinning its cocoon for pupation, a fact noticed 130 years ago by Esper, in relation to *Adopaea flava;* it is easily observed also in the case of *Urbicola comma*, the pupa becoming covered therewith; and Mathew notes (*Trans. Ent. Soc. Lond.*, 1888, p. 180) larvæ of *Pamphila phineus*, an Australian species, as dispersing the powder in the quiescent stage preceding pupation, the powder forming a whitish-purple bloom on the pupa; in these instances it is, of course, an aid in keeping the slightly-made cocoons watertight, but, in some cases, it (or something very similar) would appear to be utilised by those larvæ that adopt, later in life, an exposed feeding-habit as soon as they take on the exposed habit. Moore, quoting Thwaites, observes (*Lep. Ceylon*, i., p. 165) that, from the body of the larva of the East Indian *Gangara thyrsis*, which feeds on *Palmae*, "a loose, shaggy, filamentous clothing, consisting of pure wax is excreted, which is, however, easily rubbed off when handled, leaving the larva quite naked," whilst de Nicéville adds (*in litt.*) the important statement that the larva "lives entirely exposed, stretching itself out upon the palm-leaves." Scudder says that these rugged filamentous appendages are doubtless secreted by the tubular bristles common to the Hesperiids through life, and have, in the figures given by Moore (of *Gangara thyrsis*), all the appearance of jagged spines, and most probably secure for the caterpillar that protection which has induced an open habit of life, but knowing, as we now do, of the presence of the special glands on the 7th and 8th abdominal segments, we suspect these as the origin of the matter excreted, and thus used by the larvæ. Aitken and Davidson note that the larval cell of *Baoris bada* is powdered inside, but make no remark that the larva is so covered. The larva of *Erionota thrax* is also similarly covered. Scudder further adds that, "in diminutive keeping with this, the larva of the Nearctic *Amblyscirtes vialis*, which," of all the skippers known to him, "has the most palpable coating of extraneous matter, resembling the flocculent secretions of the *Coccidae*, and which is renewed early after each moult, also lives a partially open life, extending itself at full length along the grass blades outside its nest for a considerable part of its later life. Exactly the same habit is found, according to Fletcher, in *Pamphila mandan* (*Cyclopides palaemon* var.)." The origin and value of this extraneous matter deserves much more careful study.

Of the feeding-habits of the Urbicolids of the Nearctic region, Scudder says (*Butts. New England*, ii., p. 1548): "On escaping from the egg, the caterpillars nearly always devour the entire egg-shell (excepting the base) before their feet touch any other than the shell surface. The caterpillars live almost entirely in concealment within the nests mentioned, rarely leaving them, but usually reaching out for their food from this cylinder, and withdrawing at the slightest alarm; to aid them, the caterpillars, in their earliest stage, but never so far as I have been able to see in any later one, are provided with long, recurved hairs on the last abdominal segment, by which a securer hold must be established within the very narrow nest. Moreover, they rarely feed at any other time than at night, so that a sight of one of these caterpillars, unless the nest is picked to pieces, is, indeed, a rarity, and this is the more striking when we consider that the butterflies of this tribe form a significant proportion of our butterfly fauna." The damage done by "skipper" larvæ is occasionally noted, *e.g.*, Harris observes that the larvæ of the Nearctic *Epargyreus tityrus* sometimes almost completely strips the leaves from the viscid-locust tree, whilst Scudder observes (*Butts. New Engl.*, p. 1391) that the larvæ of *Eudamus proteus* sometimes do damage in Florida to the crops of beans, etc. We have already noted (*anteà*, p. 9) that the larvæ of *Hidari irava* sometimes does damage to the foliage of the cocoa-nut palms in Sumatra, where also the larvæ of *Erionota thrax* occasionally ravage the plantains. Except to say that, as a rule, the larvæ confine themselves to the immediate neighbourhood of their nests, and rarely wander, there appears to have been enough already noted indirectly to give a fair idea of the feeding-habits of the "skipper" larvæ.

The nocturnal feeding-habit of the Urbicolid larvæ must also be of considerable protective value, and, when to this is added the fact that some larvæ never leave their shelters even for food, but devour only what they can reach from the entrance to their hiding-place, it must be conceded that their resting- and feeding-habits must give a maximum of safety. Thus Aitken records that the larva of the Indian *Suastus gremius*, never leaves the cell it makes, but feeds on the edges or outer portions of it, whilst similar remarks are made of *Parnara bevani*; the larva of *Caprona ransonnetii* remains within its hiding-place, resting on the roof of the cell, and eats holes in the other portions of the covering until a new one is needed. He also notes that the larva of *Chapra mathias* only leaves its tent at night, when it comes out to feed. Among the Nearctic species, the larvæ of *Epargyreus tityrus* keep themselves closely concealed by day, coming forth to feed only, or mostly, by night (Harris); the larva of *Thanaos persius* rarely, if ever, ventures from home, except under cover of darkness, and, of hundreds collected, Scudder observes that he does not recall having seen one out of its tent during daylight. The larva of *T. juvenalis* also feeds only by night, resting quietly by day upon the inside of the roof of its nest, whilst that of *T. icelus* also rests on the roof of its retreat, coming out to feed only by night. The larva of *T. lucilius* only leaves its tent to get food from a neighbouring leaf, when its rapid feeding soon satisfies its appetite and it returns quickly to its shelter, where it resumes its normal position with its head and thorax at right angles to the rest of the body. Scudder also notes (p. 1456) that the larva of *Eudamus proteus* eats by night, keeping itself closely concealed in its tent by day. The leaf-tents made by the larvæ of *Pholisora catullus*, form the permanent home of the larvæ, the latter remaining curled up and hidden in them during the day, and emerging from them only at night to feed (Edwards). The larva of *Atrytone zabulon* remains quietly in its nest by day, but ranges its immediate neighbourhood for food by night. Of exceptions to this pretty general rule, Scudder notes that the larva of *Polites peckius* feeds both by day and night, retiring within its nest if in the least alarmed, whilst the larva of *Limochores taumas* appears to feed only by day, but returns to its hiding-place if in the least disturbed. Mathew observes (*Trans. Ent. Soc. Lond.*, 1888, p. 180) that the larva of the Australian *Pamphila phineus* feeds only at night, and only at this time comes out of its tent, composed of part of a leaflet of palm, usually eating the leaflet from the tip towards the base; similarly, he states (*op. cit.*, p. 182) that the larva of *Netrocoryne repanda* also only feeds by night, only then coming out of its tent, formed of a folded-over *Eugenia* leaf. The larva of *Trapezites symmomus* feeds also only by night, on *Cladium*, hiding by day very low down among the stems of its food-plant, whilst the larva of *Hesperilla picta* has a similar habit, but hides by day at the base of a *Cladium* leaf.

Many species produce "forwards." In the higher temperate regions, the number is, as a rule, comparatively small and confined to few species, but, in a lower latitude, the number is sometimes greatly increased, *e.g.*, in Britain, *Nisoniades tages* produces "forwards" only in years with an exceptionally early spring followed by a hot summer, as in 1893, whereas, in southern France, "forwards" are produced in this species every year, and the insect becomes almost permanently double-brooded in its most southern haunts. Similarly among the Nearctic species, *Thanaos persius*, *T. brizo*, and *T. juvenalis* produce "forwards" in the more southerly part of their range, whilst in the northern parts they are exceedingly rare; another ally, *T. lucilius*, produces "forwards" in each of its two earliest broods, so that larvæ of at least three ages, May, June and September, go over the winter together as full-fed larvæ. This appears to be the case also with *Pholisora catullus*. Scudder says that *Atalopedes huron* (*Butts. New Engl.*, ii., p. 1666), produces, in Florida, forwards at a very rapid pace, culminating in at least three broods and maturing as larvæ in about 27 days. *Eudamus proteus* also appears to develop many or few "forwards" according to latitude, as also do *Epargyreus tityrus*, *Achalarus lycidas*, *Thorybes pylades*, *Hesperia montivaga*, *Ancyloxipha numitor*, *Amblyscirtes vialis*, *A. samoset*, *Limochores taumas*, *Calpodes echlius*, etc., in fact, it is possibly a regular habit in the larvæ of all those species whose distribution extends from the subtropical conditions of the southern, to the temperate northern, States. The details of the life-histories of these species are, however, very imperfectly known, and, no doubt, many interesting facts will be discovered when the species are carefully reared and their habits watched under fairly natural conditions. Many exotic species appear to be continuously-brooded during the hot season, and only sometimes have a short hybernating period in the cooler season, thus, according to de Nicéville (*Butts. Sumatra*, pp. 520 *et seq.*), *Hidari irava*, *Erionota thrax*, *Gangara thyrsis*, *Kerona armatus*, *K. diocles*, and many other species, are continuously-brooded without distinct hybernating period. Mathew states (*Trans. Ent. Soc. Lond.*, 1888, pp. 179 *et seq.*) that, at Sydney, there appears to be a succession of broods of *Pamphila phineus*, from spring to autumn, but, during the winter months, the larvæ, which are then small, hybernate between leaves of palms, drawing the edges of the leaves securely together. Similarly he states (p. 186) that there is a succession of broods of *Hesperilla picta*, at Sydney, from spring to autumn, but that, during the winter months, the small larvæ hybernate low down among the stems of their food-plant (*Cladium*) in loose silken cocoons.

The larval hybernating-habit has already been touched upon (*anteà*, pp. 10-11). In many species, *e.g.*, *Urbicola comma*, *Adopaea lineola*, etc., the fully-grown larva hybernates coiled up inside the egg; in others, *e.g.*, *Adopaea flava*, *Augiades sylvanus*, etc., the larva goes through hybernation comparatively small, whilst in *Cyclopides palaemon* and *Nisoniades tages* it is fullgrown, and only waits for the spring to pupate. On the other hand, the larva of *Hesperia malvae* is a pure summer-feeder and hybernates as pupa. All these various forms of the hybernating-habit are also to be found in the Nearctic skippers. The larva of the Indian *Taractrocera ceramas* is fullfed in October, but remains in the larval state until mid-February when pupation takes place. Similarly Scudder observes that all the Nearctic *Thanaos* larvæ known to him do all their eating before the winter, close in their tents with thick silk webbing, remain therein fullfed until the spring, changing to pupæ early in the year in their hybernacula. This is, of course, essentially the habit of the larva of *Nisoniades tages*.

The peculiar habit in which many of the "skipper" larvæ rest in their tents has been repeatedly noted. It may be roughly said that they prefer to rest on the roof of their tents back downwards, and then turn the head and thorax round—sometimes at right angles to the rest of the body, at others, so that the head almost touches the tail. This is so in our British *Hesperia malvae*. Davidson, Bell, and Aitken (*Journ. Bomb. Nat. His. Soc.*, xi.) note this habit in the species of several genera, *e.g.*, *Hesperia* (*galba*), *Caprona* (*ransonnetii*), *Sarangesa*, *Coladenia*, etc. The habit has also been noted by Scudder in many Nearctic species, *e.g.*, he remarks (*Butts. New Engl.*, p. 145 *et seq.*) that the larva of *Thanaos persius* prefers to sit with its dorsum downwards, and its head bent at right angles to its body, that the larva of *T. juvenalis* rests in the same manner, etc.; he also states (p. 1422) that the larva of *Achalarus lycidas* rests, after the fashion of so many Hesperiine larvæ, with the head and tail facing in the same direction, whilst (p. 1525) the larva of *Pholisora catullus* lies with its anterior segments bent round, so that the head comes a little beyond the middle of the body, and, in nearly every instance, the tail towards the closed end of the tent. It may be noticed that the curving of the body in this manner leads to the larva occupying the least possible space in a horizontal tent, and allows the latter to be made of small size compared with the size of the larva. This is, of course, largely a Hesperiine habit, the Urbicolines making a longitudinal nest and resting in it at full length, usually folding a leaf in the direction of the veins, the cylinder often only just wide enough to hold the larval body. The exceptional habit of the larva of *Halpe moorei*, when about to pupate, as noted by Davidson, Bell, and Aitken, should, perhaps, not be passed over; it is said to form a special tent by folding over a bamboo leaf in its last instar, and then, when fullfed, to eat the leaf free at the stalk-end, so that its cell falls to the ground, where pupation takes place. An almost similar habit has been noticed in the larva of *Padraona dara* which also feeds on bamboo and eats the leaf almost through at the base of its tent, so that it often finally falls to the ground, the larva pupating in the fallen shelter.

It will be seen from this short chapter that our knowledge of the larval habits of the Urbicolids is very imperfect and scrappy, quite insufficient and too general to be of real use in drawing conclusions of family habit in many directions, although sufficiently so to give us excellent clues as to these habits in other directions. We can only urge that the poverty of facts has not been due to want of energy in attempting to discover such, but that it is largely owing to the imperfection of the records made by those who, in various countries, have not given us all the details that must have resulted from their observations.

CHAPTER III.

FAMILY HABITS IN BUTTERFLY LARVÆ—THE PAPILIONIDS.

In their widest sense, the Papilionids are generally held to contain three main divisions, the Papilionines, the Thaines and the Parnassiines. Only one of these, the first-named, has a British representative, and that but a single species, *viz.*, *Papilio machaon*. The larvæ of all these groups, however, have certain characters in common, one of the most remarkable of which, as bearing on the habits of the larvæ in the widest sense of the term, may be mentioned here. This is the osmaterium, a peculiar, retractile, forked or Y-shaped organ, generally stated to be a scent-gland, placed on the dorsum of the prothoracic segment. This is usually brightly-coloured, wholly concealed when the larva is in a state of rest, but can be suddenly protruded if the larva be disturbed or alarmed. We have already fully described its structure (*A Nat. Hist. Brit. Lep.*, vol. i., p. 95; vol. viii., pp. 22-23).

The structure must be well-known to all British lepidopterists, as it appears in the larva of *Papilio machaon*, but Wallace says (*Nat. Selec-*

tion, p. 135) that, in some exotic species, it is nearly half-an-inch long, is of a blood-red colour, etc., and he concludes, from its appearance, mode of use, and the complicated arrangement of muscles that have been developed for its protrusion and retraction, that it serves as a protection to the larva by startling and frightening away some enemy when about to seize it, and, further, that its possession is one of the causes which has led to the wide extension and maintained the permanence of this now dominant group. Its apparent restriction to this particular group of butterfly larvæ suggests strongly that the highly-modified Thaine and Parnassiine branches are merely outward expressions of this dominance, the latter having, as it were, forced its way into high mountain-regions where it alone, of this huge group, occupies the field, whilst the former, highly specialised in its food-habit and early time of appearance, is most successful in limited areas already supplied with an exceedingly numerous, competitive, butterfly fauna. At any rate the possession of the osmaterium is possibly one factor that has spelt "success" for this group in the keen struggle for existence that is taking place in all parts of the world, where the species of this group have more than held their own against all other insect competitors. Davidson and Aitken, writing of the use of the osmaterium in the larvæ of the Papilios and Ornithopteras, state (*Journ. Bomb. Nat. Hist. Soc.*, v., p. 361) that there can be no doubt that its purpose is for a defence against hymenopterous and other parasites that seek to attack them. They state that the osmaterium of the larva of *Papilio hector* emits a reddish, possibly corrosive, fluid with an offensive smell, and they further observe that they have noticed larvæ, when disturbed by ants, drive them off by swinging the head round with the tentacle extruded. Edwards is quoted by Scudder (*Butts. New Engl.*, ii., p. 1273) as saying that the larvæ of *Iphiclides ajax* rest throughout life exposed on the surfaces of the leaves, but that they appear to be effectually protected by the extrusion of the osmaterium, which gives out a peculiarly acrid or sickening odour. Floersheim states (*Ent. Rec.*, xxi., p. 115) that the larvæ of *I. ajax* are less inclined to use their osmateria than those of *Laertias philenor* and *Papilio machaon*, whilst he considers that Edwards' account of the stench produced by the acrid secretion is very greatly exaggerated, and that, to him, though somewhat stronger than that of *P. machaon*, it is no whit more disagreeable. Buckler says (*Larvae*, etc., i., p. 3) that, when the larva of *Papilio machaon* extrudes its osmaterium, the protrusion is accompanied by a drop or two of clear greenish liquid, and a most penetrating odour, reminding one of an over-kept, decaying, pine-apple. Durban notes (*Can. Nat.*, v., p. 87) that the larvæ of *Jasoniades glaucus*, if disturbed, rock themselves slowly from side to side, throwing out the forked orange lenticle, which emits at the same time a very acrid odour; Scudder, however, says that, when halfgrown, the odour from the larvæ seemed very faint and not unlike that of a spice-bush (*Benzoin*) but somewhat acrid. He adds that Neal says that the osmaterium of *Heraclides cresphontes* emits a very disagreeable odour, and avers that no birds attack the larvæ of this species, and that the shrike, which is almost omnivorous, will not touch it, nor will the bee-martin, nor the mocking-bird. Scudder further observes (*Butts. New Engl.*, p. 1323) that Abbot says that, in the southern States, owing to its musky odour, the larva of *Euphoeades troilus* has gained the name of "mellow bug," but that it seems very loth to use its osmaterium even when disturbed; the yellow osmateria of *Papilio polyxenes* are, on the other hand, said to be protruded on the slightest provocation, and emit a strong and disagreeable odour, not very dissimilar to that of the bruised leaves of their foodplant. The same observer says that, when the larva of *Laertias philenor* protrudes its osmaterium, a scarcely perceptible odour is emitted that is not altogether disagreeable, though difficult to describe. Lacordaire states (*Ann. Soc. Ent. Fr.*, ii., p. 385) that the osmateria of *Iphiclides podalirius* emit an odour that resembles that of musk. Mathew gives some details of the larvæ of the *Aristolochia*-feeding Papilios of the Pacific Islands and Australia, and he observes (*Trans. Ent. Soc. London*, 1888, pp. 106 *et seq.*) that the larvæ of *Ornithoptera durvilliana* and *O. pronomus* have deep carmine-coloured osmateria which are protruded at once when the larvæ are annoyed, whilst, of the *Citrus*- (orange, lime, etc.) feeding larvæ, he observes (*op. cit.*, p. 174) that, when irritated, the larvæ of *Papilio erectheus* protrude their two long carmine-coloured osmateria, and that, whilst the tentacles are exposed, a disagreeable odour of rotten oranges is distinctly perceptible; the larva of this species also, when nearly full-grown, sways itself from side to side with a tremulous motion if annoyed. He further notes (*op. cit.* p. 177) that, when disturbed, the larva of *Papilio anactus* protrudes its orange-coloured osmaterium, emitting at the same time an unpleasant perfume of rotten oranges.

It is to be observed that the scent (objectionable or otherwise to our human nostrils) is often noted as bearing some strongly concentrated property of the food-plant, the umbellifer-feeding Papilionid larvæ giving out an odour in which the peculiar fennel, carrot, or allied property is distinctly traceable; similarly, the scent of the *Aristolochia*-feeding larvæ contains, usually, a marked odour of the food-plant, the orange-feeders that of orange, etc. It is further generally assumed, apart from the fact that the tissues of the larva themselves are impregnated with the essential odour of the food-plant, that the smell given off from the osmateria is protective to the caterpillar, but the total evidence on the point is very small, the strongest being that of Neal (quoted *suprà*) relating to the larvæ of *Heraclides cresphontes*. We have already noted (*suprà*) that Davidson and Aitken consider that the secretion of the osmateria of the larvæ of the Indian *Aristolochia*-feeding Ornithopteras is designed for defence against hymenopterous and dipterous parasites, etc., yet they note that they have counted as many as 67 larvæ of a little hymenopterous parasite emerge from a single larva of *Papilio hector*, which, of course, is no proof that even this species is not protected, and, as bearing directly on the point, Mathew notes (*Trans. Ent. Soc. Lond.*, 1888, p. 174) that, whilst the larva of *Papilio erectheus*, which gives out a smell of rotten oranges, does not appear to suffer from the attacks of ichneumons or any other parasite (so far as his observations go), yet they are most assiduously hunted by a little bird, *Zosterops caerulescens*, which, no doubt, he adds, prevents this butterfly from causing immense mischief in the orange orchards. Similarly, the same sort of smell given off by *Papilio anactus*, appears to be no protection against the same bird, which eagerly devours the young larvæ. Floersheim observes (*Ent. Rec.*, xviii., p. 39) that he has observed spiders and larvæ of ladybirds attack and kill young larvæ of *Papilio* *machaon;* the spiders, he adds, would even attack almost full-grown larvæ, which soon died and turned black after being bitten. Writing of the larvæ of *Laertias philenor*, the same observer notes (*Ent. Rec.*, xxi., p. 148) that he has kept them in large quantities out-of-doors in a kitchen-garden, full of insectivorous birds, but has never seen either a larva or a pupa attacked by one. Mice will eat the pupæ, but even in winter the birds refuse them. The ichneumon-fly which infests the larvæ of *Papilio machaon*, he says, never stings those of *Laertias philenor*, and, out of all the pupæ which he has received from America, he has never found one containing *Trogus exesorius*, the pest of the Nearctic Papilionids. He has seen wasps hover round the halfgrown larvæ, but never seen these attacked by them.

Although one may find as many as 30 or 40 young larvæ of *Papilio machaon* on a single plant of *Peucedanum palustre* on Wicken Fen, yet each larva is found to be living singly and independently, and to show no gregarious tendencies, and the larvæ of the Papilionids generally appear to be solitary in their habits. A few exceptional instances, however, have been recorded, and Scudder notes (*Butts. New Engl.*, i., p. 1223) that, in one South American group, the caterpillars live on plants belonging to the *Aurantiaceae*, in societies of one or two hundred individuals, and, when young, feed side by side in rows, whilst the larvæ of one Nearctic species, *Laertias philenor*, are strictly gregarious in early life, and semigregarious afterwards, distributing themselves when fullgrown over the foliage of the *Aristolochia*, on which they feed. Edwards describes in detail (*Can. Ent.*, xiii., p. 13) how the newly-hatched larvæ of this species betake themselves to the edge of a leaf, and, ranging themselves at right angles to this, side by side, feed after the manner of large *Bombycidae*, that this habit continues till they are halfgrown, when they separate; Scudder observes (*Butts. New England*, p. 1249) that one he separated rested on the underside of a leaf, but that, as soon as a companion was provided, they at once travelled from the upperside, where they were placed, to the underside, and remained there, resting side by side. Floersheim observes (*Ent. Rec.*, xxi., pp. 146-7) that the young larvæ feed on all occasions on the underside of the leaf, and are gregarious, each batch of eggs splitting up as a rule into two companies of larvæ; whilst feeding, the larvæ touch one another, so that, if one of them moves, it sets the others in motion by the imparted shock, and if one extrudes its osmaterium the rest follow suit; a little later they rest in small companies, usually of ten to fifteen on the underside of a leaf of *Aristolochia* ranged in files like bands of soldiers, with heads pointing indifferently inwards to stem or outwards to tip of leaf; when two-thirds grown the larvæ are still gregarious, though less so than in the earlier stages, and rest usually, but not invariably, on the underside of the leaves, whilst, when fullgrown, the larvæ, though still exceedingly sociable, are not strictly gregarious, and are often to be seen feeding upon the stems of the young growth of *Aristolochia sipho*, or sunning themselves on the topmost stems of the foodplants in companies of two and three, where they become most conspicuous objects. Davidson and Aitken, writing of the "*Erithonius* group" of Papilionids in India (*Journ. Bomb. Nat. Hist. Soc.*, v., pp. 367 *et seq.*), observe that the larvæ of *Papilio liomedon* feed on *Acronychia laurifolia*, that they are quite gregarious, dispersing occasionally to feed, but always returning to rest side by side on the upper surface of a leaf of the foodplant. One suspects that the remark of these authors (*op. cit.*), that they found the larvæ of *Papilio erithonius*, "literally in flocks," feeding on a leguminous plant with aromatic leaves, does not simply mean that the larvæ were in extraordinary abundance, but that they were, in the strict sense, gregarious.

The Papilionid larvæ, based on their resting-habits, fall roughly into three groups: (1) Those that rest quite openly, and whose general coloration and appearance make the larva resemble a bird's-dropping, or something quite different from a lepidopterous larva, especially when young. (2) Those that cling closely to a certain part of their foodplant, and whose shape, colour, and general appearance bring them into close protective resemblance with their immediate surroundings. (3) Those that rest openly and exposed, their brilliant colours in general harmony with their surroundings, but yet are generally assumed to gain protection less from cryptic effects resulting from their resting-position, than from other causes, objectionable taste, smell, etc., to which their bright colours are assumed to act as a guide, the latter, consequently, being usually designated "warning colours," though their efficacy is, in most cases, very problematical.

We have already discussed the resting-position with regard to the larval coloration and its possible cryptic value or the reverse, in the Papilionid larvæ (*anteà*, vol. viii., pp. 67-72), and, except incidentally, it does not appear to be at all necessary to cover the same ground again, although, in dealing with this chapter, students should certainly refer to what is there written. Buckler observes that the usual attitude of the larva of *Papilio machaon*, in repose, is, from the very first, much like that of a Sphinx, with the neck arched and the head bent down, but Floersheim notes (*Ent. Rec.*, xxi., p. 14) that, although, when very young, the larva of this species rests thus, with its foresegments raised and arched, giving the appearance of a miniature seahorse (a position particularly adopted when undergoing ecdysis), it also more frequently rests with the foresegments very slightly raised and not arched, the young larva holding itself to its pabulum by means of the last three pairs of prolegs or anal claspers, keeping its thoracic legs tightly shut, and that this position is the one usually taken when the larva is merely at rest after feeding. Generally it rests with its head towards the base of the leaf, but always on the upperside, and, even in heavy rain, the young larvæ will not retreat to the underside of the leaves; as it gets older it still keeps to the upperside of the leaf, usually near the midrib, but, as it nears maturity, loses the habit of resting with the head towards the base, and turns its head towards the apex of the leaf, and does so almost entirely when fullfed, although, at this time, it also sometimes rests on the stems of young shoots, upon the leaves of which it has been feeding. When young, the larva seems to rely for protection almost entirely on cryptic effects, but warning when discovered. The young larva, black with a white saddle, imitates a bird's-dropping; later it becomes light green with black bands and orange spots, and away from its food looks conspicuous enough, but, on its foodplant, especially among the flowerheads, is not at all easy to see. Floersheim thinks that the appearance of the "bird's-dropping" stage may serve a double purpose, as, when feeding on the seed-pods of *Dictamnus*, the larvæ are much paler in colour, and closely resemble the light brown-green colour of the pods. Our own experience of the larvæ of other umbellifer-feeding species is that their resting-habits are somewhat similar to those of *Papilio machaon*. This is certainly the case with the larva of *P. alexanor*, which, when small, closely resembles a bird's-dropping, but, when larger, is not at all easy to discover among the umbels of the foodplant, unless closely sought after, although, stretched out at full length, it appears somewhat conspicuous. Mathew notes (*Trans. Ent. Soc. Lond.*, 1888, p. 176) that the larvæ of *P. erectheus* feed perfectly exposed, and the young ones bear a strong resemblance to a bird's-dropping. The gregarious larvæ of *Laertias philenor* often rest with their thoracic legs clasped and the front segments raised, but not nearly so much as those of *Papilio machaon*, although they often take up an outstretched position, with the true legs touching the surface of the leaf; in their early stages they habitually rest on the underside of the leaves of their foodplant, and, later, when they are about to undergo ecdysis, but they also take up this position later in life, not, Floersheim thinks, for the purpose of concealment, as Scudder avers, but because of the difficulty of finding foothold on the upper surface; the larvæ, however, much more frequently select a position at the end of a young shoot, resting with the anterior segments slightly raised, whilst the full-grown larvæ feed fully exposed in companies of two and three, loving to sun themselves, when not feeding, on the topmost stems of their foodplant, where they are most conspicuous. Floersheim notes that the immature red-brown larvæ, massed together on the undersides of the large leaves of *Aristolochia sipho*, bear a somewhat striking resemblance to the brown blotches which form on the sunburnt leaves, although, as already noted, they seem to court exposure later in life.

The larvæ of *Heraclides cresphontes*, when young, resemble very closely the excrement of birds, which Scudder supposes may afford a considerable protection against insectivorous animals; when young, also, they appear to choose the underside of the leaves on which to rest, motionless, but, later, they select the upperside, and, when full-grown, the branches or the long leaf-stalk of prickly-ash, a foodplant they share with orange, etc. The larva of this species maintains the bird's-dropping appearance throughout life. The larva of *Jasoniades glaucus* when young, prepares a definite resting-place; it weaves a silken carpet on the leaf, and remains thereon with its body arched when not feeding, travelling to the edge of the leaf to feed, and biting deep excavations therefrom, and returning to its resting-place. After moulting it selects a new drooping leaf, and spins a fresh carpet, always choosing, however, a position in which its body hangs, when at rest, in a vertical or nearly vertical position, with its head upwards, so that its excrement falls to the ground and the carpet remains clean. After its third moult, and contemporaneously with its change to adult colour and form, the larva changes its method of constructing its web or hammock, which is now scarcely at all attached to the centre of the leaf, but spins interlacing threads from one side of the leaf to the other; Gosse says (*Can. Nat.*, p. 293) that the larva stretches its bed of silk so tightly from one edge of the leaf to the other, that it bends it up, and a section of it would represent a bow, the silk being the string, and that, on this elastic bed, the larva reposes, the fore-part of the body drawn in so as to swell out that part on which the eye-spots are very conspicuous. Trouvelot notes (*Proc. Bost. Nat. Hist. Soc.*, xii., p. 92) that, on a lilac-leaf, the silk was so spun that, on a wet morning, it acted as a real bridge, built over a torrent. The larva, however, still hangs with its body almost vertical, Fitch noting that, on an apple-leaf, the weight of the larva inclines the leaf almost to the perpendicular, the leaf and larva swinging in the wind.

The young larva of *Euphoeades troilus* makes a little hiding-place by folding over a portion of a leaf near the apex, and, in this, rests when not feeding, the deepest part of the nest being somewhat cylindrical, so that an opening of about 3mm. in diameter is found at the end away from the tip of the leaf, through which the larva finds ample room to creep even after it has passed its first moult, which it does in this chamber, whilst larvæ are sometimes to be found therein even at the beginning of the third stage, but, as it increases in size, it uses the whole of one side of a leaf, constructing a long, and rather narrow, flattened cylinder, lined with silk, out of which it can crawl at either end, when it leaves this retreat to go to other leaves for food; as it increases in size, a still larger portion of a leaf is utilised, until, in its last stage, it takes up a position on the midrib, and spins over the two halves of the blade of the leaf till they meet exactly above its back. It thus passes its entire larval life, except when feeding, in concealment, undergoing its ecdyses within its cleanly home, for in this it drops no excrement, nor does it suffer any of its exuviæ to remain, eating up its cast-off skin, and even thrusting its no longer needed skull-cap out upon the ground. Buckler also notes (*Larvae Brit. Butts.*, etc., i., p. 2) that the larva of *Papilio machaon* eats its cast skin except the head-piece, and further, that he once observed a larva, that found a speck of frass on its food, pick it up in its jaws, stretch out its body, and somehow project the frass away from the plant. On the other hand, Scudder (*Butts. New England*, p. 1360), speaking of the moulting-habit of *Papilio polyxenes*, says that the cast skin is not eaten. The larva of this species, like that of *P. machaon*, rests exposed, and, when about to moult, selects a very open position, frequently the top of a stem, where it rests head upwards, apparently to avoid the danger of being rubbed at that time by the neighbouring leaves moved by the wind.

Whilst the adult larvæ of the species just mentioned largely exhibit distinct warning colours, and rest more or less exposed, the larvæ of that group of Papilionids of which *Iphiclides podalirius* is an excellent example, are, as a rule, green in colour, delicately marked with pale tints laterally, and take up a position at rest in which the larva bears, by colour and position, an exact and detailed resemblance to the part of the plant on which it rests absolutely immovably unless feeding. In such cases the resting-habits usually aid the cryptic effects produced by the coloration of the larva, and a lethargic immovable habit is particularly frequent in the shrub-feeding, as opposed to the umbellifer- and *Aristolochia*-feeding, groups in which an exposed resting-habit is usual.

Although somewhat closely allied to *Iphiclides podalirius*, the larvæ of *I. ajax* develop much more striking and definite colours than those of the former, yet Scudder considers that these brighter colours are not merely warning colours to show off the inedibility of the larvæ, but have a cryptic effect, the stripes particularly growing obsolescent towards maturity, and leaving the larva more completely green. Floersheim observes that the quite young larva of *I. ajax* rests usually either on the underside of the leaves of *Asimina triloba* (papaw) or upon the dark grey stems of that plant with which its colour exactly harmonises; at rest, it does not adopt the "Sphinx-like attitude" so frequently presented by the young larva of *Papilio machaon*, but is outstretched; when undergoing ecdysis it rests either on the underside of a leaf or upon the stem of its foodplant. When it gets older the larva rarely rests on the stem, but chooses the underside of a leaf, and is indifferent throughout life whether the head points towards the stem or tip of a leaf. Floersheim adds that, if a larva is found resting on a stem, it is always of the grey variety which resembles the wood in colour; further, that the larvæ of this species, unlike those of *P. machaon* and *I. ajax*, conceal themselves carefully all their life, that, when young, it is not content with closely resembling a small grey slug, but hides itself usually either on the underside of the leaves or upon the stems of its foodplant, and that, when full-grown, its yellow-banded green-grey shape, swelling considerably towards the head (which resembles a blunt leaf-tip), and tapering to a stem-like tail, seen at right-angles to the leaf upon which it feeds or rests, presents the exact appearance of a bent or unfolding young leaf of *Asimina triloba*, with the sunlight playing on its semi-transparency. Taylor notes (*Trans. Ent. Soc. Lond.*, 1904, p. 409) that the colour of the full-fed larva of the Jamaican species, *Papilio homerus*, harmonises closely with the tint of the leaf of its foodplant. Davidson and Aitken state (*Journ. Bomb. Nat. Hist. Soc.*, x., pp. 581 *et seq.*) that the larva of *Papilio buddha*, which feeds on the tirphal tree, rests motionless on the upperside of a leaf, which is of exactly the same shade of green as itself, that it is slightly speckled with a paler shade in imitation of the effect produced on the leaf by minute insects eating away the soft tissue, whilst it often holds the head and front part of the body raised in the well-known Sphinx attitude.

The Papilionid larvæ are usually sluggish in habit. When young their safety appears to depend largely on their immobility, and, when older, their large size and weight tend to make it dangerous for them to move really quickly. The larvæ of *Papilio machaon* are sluggish, particularly when young, and Floersheim records that he has known a larva starve on a withered leaf rather than migrate to a living one touching it. The young larva shakes its head sharply from side to side, as also when older, if an aphis or other insect touches it. The larva of *P. alexanor* appears to have very similar habits, and in nature will eat a plant almost bare before migrating to another. Edwards says that the larvæ of *Jasoniades glaucus* and *J. rutulus* are also exceedingly sluggish in habit, usually only moving when impelled by hunger, whilst, if disturbed, the larva of the former rocks its body slowly from side to side and throws out its osmaterium. The larvæ of *Euphoeades troilus* are also sluggish, but Scudder says (*Butts. New Engl.*, p. 1328) that such movements as the fullgrown larva makes, when exposed to view, appear absurdly affected; it moves, or seems to glide, by little starts, about a second apart, in a very slow or measured way, and he adds that this movement is evidently no necessity of its organisation, but a superinduced habit for some protective purpose, probably in co-relation with its great thoracic spots and hunch, and he suggests that the panting, spasmodic approach of so singular-looking an object may be a source of fright, or possibly of curiosity, to some of its natural enemies, and sufficient to protect it till it again gains cover. Edwards says (*Can. Ent.*, xiii., p. 13) that the larvæ of *Laertias philenor* are far more active than those of any other Papilionid species, and can travel with great rapidity. Scudder adds (*Butts. New Engl.*, p. 1249) that the front filaments of the larva are freely movable, and that, when travelling, the caterpillars keep them in constant motion up and down, generally alternating through an angle of about 25°, in the downward movement not quite reaching the surface on which they are walking; Scudder also observes that, during their fourth stage, the larvæ have a curious habit of tapping on the leaf repeatedly, though not rapidly, with the anterior pair of legs, not simultaneously, but one at a time. Floersheim also notes (*Ent. Rec.*, xxi., pp. 147-148) that the larva of this species is exceedingly active after its middle stadium, noting that it will often crawl a distance of 200 or 300 yards in order to find a suitable place for pupation, and adds that, like the larva of *Papilio machaon*, but unlike that of *Iphiclides ajax*, the larva always moves forwards, and will turn completely round rather than go backwards. He confirms Scudder's account of the peculiar habit that the adult larva (in its fourth and fifth stages) has of drumming with its thoracic legs on leaves, both when feeding or half-resting; he has also seen it do so on the backs of its companions. Of the newly-hatched larva of *I. ajax*, Floersheim also notes (*op. cit.*, p. 114) that it is very active, crawling about the stem and leaves of papaw readily, and letting itself down by a silken thread if disturbed or frightened; when older it loses the habit of descending by means of a silken thread, but remains rapid in its movement till the end. It, however, will only display its activity if disturbed or in search of food.

The silk-spinning habit of the Papilionid larvæ is closely allied to the usual sluggishness of habit, the silk being often spun as a means of security of foothold; thus, Fitch says that, as the larva of *Papilio polyxenes* walks along the slender pedicels of an umbel of its foodplant, it moves its head first to one side and then to the other of the stem, attaching a slender thread of silk which it spins from its mouth to the stem to form a more secure foothold. Mathew notes (*Trans. Ent. Soc. Lond.*, 1888, p. 173) that the orange-feeding larva of *Papilio erectheus* spins silk on the orange leaves to obtain a more secure foothold. Buckler notes (*Larvae Brit. Butts.*, p. 2) that the larva of *P. machaon* also spins silk for a foothold, but Floersheim says (*Ent. Rec.*, xxi., p. 16) that the quantity of silk spun by this species varies with the foodplant, that, on *Ptelea*—a tree—the young larvæ spin noticeably more silk than when feeding on the lower-growing *Skimmia* bushes, whilst on fennel-plants the larvæ seem to spin no silk at all, perhaps, he adds, because the slender and rounded leaves of the fennel afford a sufficiently secure position without having to attach themselves to anything else. Scudder says that the silk-spinning habit is well-developed in *Laertias philenor*, and that, without its support, its heavy weight would prevent it from obtaining a firm hold, but Floersheim (*Ent. Rec.*, xxi., p. 148) has only observed it to spin silk when about to undergo ecdysis, and then it does so freely. The same observer also notes (*op. cit.*, p. 114) that, with the exception of letting itself down with a silken thread when recently hatched, the larva of *Iphiclides ajax* makes little use of silk, even when undergoing ecdysis, a fact perhaps due partly to its living always on the underside of the leaves or upon the stems of its foodplant, partly to the fear of betraying its presence. Scudder states that the larvæ of the Nearctic genus, *Jasoniades*, spin a silken web over a whole leaf of the foodplant, and so draw the sides together, hiding in the trough thus made; when not feeding, Edwards says that the young larva of *Jasoniades glaucus* takes up its position on the upperside of a leaf, over which it spins a bed of silk, and that the leaf, as it increases in size, is somewhat drawn together, so that the leaves on which larvæ are resting can readily be distinguished, whilst he adds that the larva of *J. rutulus*, like the last, also weaves a web across the upper surface of a leaf which is also somewhat drawn together, the firmly-drawn web serving as a bridge on which the larva rests, and leaving an open space below between the web and the leaf. Scudder observes (*Butts. New Engl.*, p. 1322) that the young larva of *Euphoeades troilus* bites out a channel down one side of a leaf about 1·5cm. from the tip, straight or a little obliquely to the midrib, folds over the flap thus obtained upon the upper surface of the opposite side, the larva living in the depth of the cavity thus made; this cavity it covers next the midrib with repeated crossings of transverse strands of silk, so as to form a dense glistening whitish carpet, thickest in the middle, and extending the whole length of the enclosure made; if forced open by hand the flap at once regains its former position when freed, showing the tenseness of the silken strain. As the larva gets larger, it chooses a larger portion of leaf, until, in its final stadium, it spins a silken floor along the midrib, carries the spinning over to each half of the blade until the transverse silken bands arch the two halves over so as to meet above its back, and thus forms a cylindrical silk-lined chamber in which it lives. Aitken and Davidson observe (*Journ. Bomb. Nat. Hist. Soc.*, v., pp. 363 *et seq.*) that the larvæ of the "*agamemnon* group" of Papilios are extremely shy and cautious, resting motionless most of the day on the upperside of a leaf, along the midrib, with the head towards the stalk; the leaf on which they rest being usually carpeted with silk.

The specialisation of food-habit, and its modifications among the Papilionids would, were we able to deal with it at length, make an interesting chapter. We can, however, here merely refer to the specialisation of food-habit in the Thaids and Parnassiids, the larvæ of the former being practically confined to *Aristolochia* for their foodplants, whilst the latter appear to be just as restricted to plants of the natural order *Crassulaceae*—saxifrages, etc. The various Papilionine tribes also specialise largely in this direction, *e.g.*, the "*machaon* group" select mainly plants belonging to the *Umbelliferae*, the "*podalirius* group," those belonging to *Rosaceae*, the "*philenor* group," to *Aristolochia*, etc., but a really useful study of the food-habit in this large group, would require more space than we can afford. We may, however, note that, of the species of the "*machaon* group," we find that *Papilio machaon* itself, although feeding in nature on a variety of Umbellifers, adapts itself easily to others. Floersheim, who has reared large numbers under semi-natural conditions in his butterfly-house, reports (*Ent. Rec.*, xxi., p. 15) that *Skimmia oblata* appears to be its favourite foodplant, the imagines laying more eggs on this than on fennel that grows by its side, and which appears to be second favourite: it also feeds on rue, dittany (*Dictamnus fraxinella*), preferring the aromatic seedpods of the latter, and on *Ptelea*, though larvæ on the last-named take at least twice as long to feed up as those on *Skimmia*. Floersheim himself notes (*Ent. Rec.*, xvi., pp. 316-7) that, contrary to the larva of *P. machaon*, that of *P. asterias* refused to touch *Skimmia*, but took readily to all the Umbellifers on which *P. machaon* feeds. Strangely, Bentall states (*Ent. Rec.*, xviii., p. 23) that, in his butterfly-house, both *Papilio machaon* and *P. asterias* neglected the *Skimmia* for fennel, on which, and carrot, they fed up rapidly, and few umbelliferous plants seem to come amiss to *Papilio machaon*, even *Echinophora spinosa* being recorded (*Ent. Rec.*, xvii., p. 297). Sheldon says (*in litt.*) that the larva of the allied species, *Papilio hospiton*, is confined apparently to a single species of fennel, with yellow umbels and growing about 4ft. high, the giant species of fennel produced no larvæ, although carefully searched. The larva of *Papilio alexanor* is equally restricted to *Seseli montanum*, and appears to attack no other plant. The Nearctic species, *Papilio zolicaon* and *P. brevicauda*, close allies of *P. machaon*, are equally restricted to umbelliferous plants for food, the former prefers *Foeniculum vulgare*, whilst the latter eats wild parsley, *Angelica*, and parsnip indifferently, and, although Edwards notes the larvæ of this species as being found wild on *Angelica*, they were also discovered on almost every parsnip plant in the gardens at Placentia. Another ally, but this time a subtropical species extending into the southern States, *Papilio polyxenes*, appears able to accommodate itself to a large number of Umbellifers, but does not go outside the natural order, except that, in the case of *P. machaon*, it readily takes to an introduced species of rue, *Dictamnus fraxinella*.

Our other widely-spread European species, *Iphiclides podalirius*, belongs to a group of Papilionids whose larvæ have an entirely different food-habit. The larva of *I. podalirius* feeds on trees, preferably fruit-trees of the natural order *Rosaceae*, sloe, almond, apple, pear, etc., whilst Scudder notes that the Iphiclidid group of swallowtails appears to have its metropolis in South America, the larvæ being like our European species solitary, and preferring plants of the natural orders *Rosaceae* and *Anonaceae* as food.

The larva of the Nearctic *Euphoeades troilus* usually feeds on *Lauraceae*, but is also recorded as doing so on plants belonging to other orders, *e.g.*, *Magnolia glauca*, *Xanthoxylum americanum*, *Prunus persica*, *Pyrus arbutifolia*, etc. The larvæ of *Jasoniades*, Scudder says, live in solitude on trees belonging to a great many natural orders, that of *J. glaucus* being noted as feeding on apple, quince, plum, cherry, birch, alder, ash, and oak; the larva of *J. rutulus* feeds on willow of several species, *Salix lasiolepis*, *S. lasiandra*, etc., but never on *S. nigra* (Edwards), and that of *J. eurymedon* is reputed to feed on *Frangula*.

The *Aristolochia*-feeding Papilionids appear to have a very wide range, practically world-wide, *e.g.*, the Nearctic *Laertias philenor*, the Indian *Ornithoptera minos*, *O. hector*, etc., the Sumatran *Menelaides antiphus*, the Torres Strait *Ornithoptera pronomus*, the Pacific Islands' *O. durvilliana*, etc. Similarly, the *Citrus*- or orange-feeding Papilionids have an almost world-wide distribution; in America there is the well-known *Heraclides cresphontes;* in Sumatra *Papilio polytes*, *P. demoleon*, *P. helenus*, *P. nephelus*, and *P. memnon* (de Nicéville); in India, *P. erithonius*, *P. polymnestor*, etc. (Davidson and

Aitken); in Thursday Island, *P. indicatus;* in Australia, *P. erectheus* and *P. anactus* (Mathew), etc.

It has been before noted how the larvæ of *P. machaon* eats "rue" with avidity, and that the American *P. polyxenes* takes readily to the introduced *Dictamnus fraxinella;* it is to be noted that Davidson and Aitken observe (*Ann. Bomb. Nat. Hist. Soc.*, v., pp. 366 *et seq.*) that the larva of *P. erithonius*, one of the commonest Bombay species, whose usual food is lime and orange, forsakes these for the unpleasantly odoriferous garden-rue. It is to be noted that many authorities now refer the orange, lime, etc. (the old *Aurantiaceae*) to the *Rutaceae*, to which rue, skimmia, and dittany belong.

Of the feeding-habits of the Papilionid larvæ, various scattered details have been published, which are, however, difficult to summarise. The newly-hatched larva of *Papilio machaon* eats its eggshell very completely, that of *Laertias philenor* partly, whilst that of *Iphiclides ajax* appears (contrary to Scudder's statement) only to eat a hole sufficiently large to escape from, so that there is no uniformity in habit throughout the superfamily, although there may be in the separate groups. Similarly, the young larva of *Papilio machaon* always eats its cast skin, and continues to do so all its life, that of *Laertias philenor* often, but not necessarily always, does so, whilst that of *Iphiclides ajax* follows *Papilio machaon* in this respect, regularly eating its exuviæ throughout its larval life. Aitken and Davidson (*Ann. Bomb. Nat. Hist. Soc.*, v., p. 368) also note that the young larva of the Indian species, *Papilio liomedon*, eats its cast skin. The mode of feeding varies considerably among the various species, but, except when very young, and sometimes even then, the larvæ eat through the whole thickness of the leaf; the species vary too, as to the time at which they feed, *e.g.*, Mathew says that the larvæ of *Papilio erectheus* feed only by day, remaining perfectly quiescent throughout the night, but Floersheim says that the larva of *Papilio machaon* will feed at any time from early morning until after sunset, but some will feed long after others have ceased to do so; the larva, when feeding, usually rests with its head towards apex, and eats right down it from apex of base, always resting, it appears, on the upperside of the leaf when so engaged. On the other hand, the larva of *Iphiclides ajax*, like *Papilio erectheus*, feeds entirely during the day, and rests on the underside of the leaf when so engaged, eating, at first, small circular holes out of the leaves, but, later, from apex to base of leaf, retreating down the midrib as it feeds. The young gregarious larvæ of *Laertias philenor* feed on the underside of the leaves of their foodplant, but, when older, and especially when full-grown, feed on the stems in preference to the leaves; the real reason for the larger larvæ not walking on the upperside of the leaves, is that they are rarely sufficiently flattened to afford a foothold, and that, being exceedingly active, and not accustomed to spin much silk, they are liable to fall off the upperside of the *Aristolochia* leaves. Floersheim notes (*Ent. Rec.*, xxi., p. **147**) that two or three larvæ will simultaneously devour a stem of *Aristolochia*, completely enveloping it, so that no green is to be seen, and will feed it down, with their heads almost touching from several sides at the same time. The Sumatran species, *Menelaides* (*Papilio*) *antiphus*, also devours the stalks, as well as the leaves of *Aristoiochia indica*, whilst another Sumatran species, *Troides amphyrsus*, that feeds on a creeper with large trilobate leaves, devours not only the leaves, but the bark and soft shoots of their foodplant, when the leaves are demolished. The larvæ of this species are said by de Nicéville to make a very audible noise when eating, just as the larvæ of large Saturniid moths do. Similarly, the young larvæ of *Heraclides cresphontes* feed at first only on the tenderest leaves of orange-trees, but, when well-grown, eat both leaves and shoots (that have not hardened into wood), sometimes completely demolishing young trees, and appearing to feed wholly in the daytime. The larvæ of *Papilio polyxenes*, another orange-feeder, is said to feed openly and to eat voraciously, especially in the last stage. Hamlin's observation (*Scudder's Butts. New England*, p. 1360), that a larva of this species, in the antepenultimate stage, doubled its length in a single morning from ·5in. to 1in., and increased ten times its bulk in the same time, requires confirmation, but, for all that, in the more southern localities of this species, the larvæ do feed up rapidly, Grundlach noting that, in Cuba, the larval life does not last altogether more than nine or ten days. The feeding-habits of the more cryptically-coloured Papilionids are very different from those that live fully-exposed, the former, as a rule, being more sluggish, slower both in movement and feeding, and often, consequently, in growth, a character particularly noticed in the Bombay species by Davidson and Aitken, who observe (*Ann. Bomb. Nat. History Soc.*, v., pp. 361 *et seq.*) that, whilst the larvæ of the *Ornithoptera* group are easy to rear, eat freely in any situation, and grow fast, the larvæ of the *Agamemnon* group are very dissimilar in their habits, being extremely shy, resting motionless during the day, eating little and growing slowly, habits shared largely by our better-known *Iphiclides* larvæ. Many of these cryptically-coloured larvæ, too, leave their resting-place for food, not resting on the leaf they have partly eaten. Scudder notes that the larva of *Jasoniades glaucus* feeds both by day and night, does not devour the leaf it rests on after its first moult, but goes off every few hours for a dinner on another leaf, indeed, the same leaf as it has dined on before, always finishing one on repeated visits, before attacking another. He further notes a similar habit in the larva of *Euphoeades troilus*, which, however, as already noted, makes throughout its life a cylindrical nest of a leaf, or part of a leaf, in which it hides, and which it leaves only for the purpose of feeding, usually on some other leaf only attacking that of which it makes its hiding-place when quite young.

As bearing on the feeding-habits of the Papilionids, it may be noted that more than one author observes in some particular species cannibalistic tendencies, *e.g.*, Aitken and Davidson say (*Journ. Bomb. Nat. Hist. Soc.*, v., pp. 362 *et seq.*) that the larva of *Ornithoptera minos* will, if not well-supplied with fresh food, devour pupæ of its own kind, whilst Witfield notes (*Scudder's Butts. New England*, p. 1273) that the larvæ of *Iphiclides ajax* show more highly-developed cannibalistic propensities than any other Papilionid larvæ of his acquaintance; with regard to this, Floersheim states (*Ent. Rec.*, xxi., p. 115) that only when short of food does the larva of *I. ajax* show cannibalistic tendencies, and then not to any great extent; he says that he only lost two out of twenty in this way, though they were so short of food that several were unable to pupate successfully.

Too little is recorded of the larval habits of the Papilionids of the more northern latitudes for us to be able to judge how far the development of "forwards" or "laggards" takes place, but, throughout southern and central Europe, a more or less ill-developed partial second-brood of *Papilio machaon* takes place, much more numerous, however, in the low levels of southern Europe; the percentage of second-brood examples in England is certainly very small. Floersheim (*Ent. Rec.*, xxi., p. 15) puts it at from one to two per cent. only, increasing to as many as five per cent. in warm summers, but he states that it is not always the most rapid-feeding larvæ that produce second-brood examples, the pupæ that do so are certainly among the early-formed ones, but not, in all cases, the very earliest; indeed, in 1908, out of the twelve pupæ first formed, only two produced second-brood imagines, in spite of their being subjected to a forcing heat in a vinery for more than three weeks; the others lived, but obstinately refused to be forced, whilst others, which had pupated a week later, gave rise to second-brood imagines under natural conditions, so that, though all larvæ which produce second-brood imagines feed up rapidly, many of those which feed up rapidly do not disclose a second-brood. Another point indicated, was that, among the larvæ themselves, there is a great variety in the time taken to feed up, the last larvæ resulting from ova laid during the first part of July, not pupating for fully ten weeks, whilst the bulk, although taking longer to feed up than the very quickest ones, did not take more than two-thirds of the time spent by the slowest. A similar habit was recorded (*Ent. Rec.*, xxi., p. 147) by the same observer with regard to *Laertias philenor*, about ten per cent. going forward to a second-brood, but, like *Papilio machaon*, it was not the very fastest-feeding larvæ that produced imagines the same year, although those that did so were among the fastest, but the "laggards" always go over the winter as pupæ. In this species, too, the percentage also appears to vary in accordance with the season, the intensity of the sun, Floersheim thinks, being the chief factor. But, in its native home, this Nearctic species produces "forwards" regularly, apparently in proportion to latitude; in the southern States, whole broods go forward, and the species is reported as continuously-brooded from "early spring to frosts;" farther north it becomes triple-, and then double-brooded, but it is essentially a southern species, with a tendency to dispersal, and, in the most northern localities it reaches, its habits appear to be on all fours with those of *Colias edusa* with us. Not unlike this species in its habits is the largest of the Nearctic Papilionids, *Heraclides cresphontes*, an interloper from the tropics according to Scudder, which, similarly, appears to be continuously-brooded in the southern States with, at least, four practically complete broods in Florida, but with the number of "forwards" rapidly decreasing till it is only partially double-brooded in its more northern limits; the evidence seems to show that this species also has no permanent standing in these districts, and the larval habits as described by Seagrave at Cambridge, Mass. (*Scudder's Butts. New England*, ii., p. 1343) also remind one much of those of *Colias edusa* in central and northern Europe. Somewhat similar are the larval habits of *Papilio polyxenes*, another southern species that spreads into more temperate regions, which is almost continuously-brooded in the West Indies and the southern States, but, as it goes further and further north, the number of "forwards" becomes fewer, until, in the more northern parts of its range, it is only partially double-brooded, having lost to a great extent the rapidly feeding-up habit of its southern habitats. It is quite possible that, in all the Nearctic species just mentioned, the over-wintering pupæ comprise individuals from every brood of the preceding year; this is certainly the case with *Jasoniades glaucus*, which, however, instead of being a subtropical species spreading north, appears to be a warm temperate-region species spreading south. It certainly produces "forwards" inversely in proportion to the latitude it is inhabiting, being reported as absolutely single-brooded in the more northern parts of its range, whilst further south, in suitable seasons, a good many forward larvæ are produced resulting in a partial double-brood, the number of "forwards" increasing as one goes south, until, in the Gulf States, it is almost fully quadruple-brooded, though, even here, there are some "laggards" in every brood, the spring-emergence of any year consisting, as noted above, of the combined hybernating pupæ of all the broods of the preceding year. Edwards notes that, of a brood of *J. glaucus*, reared at Coalburgh, some 50 larvæ pupated between July 1st-8th, that, of these, 27 gave butterflies the same season, the rest not till the following spring; he considers, however, that the percentage varies much according to season; of the "forwards" emerging in July, a small percentage of the larval progeny sometimes feeds ahead, and produces autumnal imagines, but the number is small. In its larval habits *Euphoeades troilus* is not unlike *Jasoniades glaucus;* in its northern range, *E. troilus* lays eggs in June, and many of the larvæ feed ahead as "forwards," pupating in due course, and producing a large partial second-brood in August, the progeny of which catch up their uncles and aunts in the pupal stage; in the southern States, the species appears to be wholly double-brooded, without any attempt, however, to produce any "forwards" (or a consequent partial third brood) among these late summer-feeding larvæ.

We know that our European *Iphiclides podalirius* produces a large number of "forwards" in its southern localities, in fact, its range appears to be to a great extent limited to those districts that allow a double-brood, but details are wanting entirely as to the proportions produced, or how far a third brood occurs, by the development of "forwards" among the larvæ resulting from the second-brood. In the allied *Iphiclides ajax*, however, Edwards observes that "forwards" occur freely in the different broods. Thus the spring form appears in April as var. *marcellus*, and in May as var. *telamonides* (both from over-wintering pupæ); the eggs laid by these produce respectively about 90 and 65 per cent. of "forward" larvæ, the imagines from which appear in June as the form *ajax;* of the progeny of these June *ajax*, about 40 or 50 per cent. are again "forwards," producing *ajax* in August and September; the "laggards" in all these broods, as well as the whole of the August and September larvæ, go through winter as pupæ, and produce either var. *marcellus* in April, or var. *telamonides* in May; in the most southern States the percentage of "forwards" is much greater, and there are at least three consecutive partial summer-broods of the *ajax* form.

It would appear that many, probably most, of the subtropical species are almost continuously-brooded throughout the greater part of the year, at least that part that is suitable meterologically. Mathew records (*Trans. Ent. Soc. Lond.*, 1888, p. 176) that *Papilio erectheus*, a north Australian species, is continuously-brooded from August to

February, the February-March larvæ pupating, however, and remaining such till August; similarly, *Papilio anactus* is continuously-brooded from October to March. We know, however, no details of the proportions of "forwards" in each of the broods, or whether only some in each brood exhibit this "forward" habit.

This meagre summary indicates very clearly our ignorance of the larval habits of this most conspicuous, and widely distributed, group of large butterflies on many interesting and vital points, and shows how much still remains to be done. No doubt a fuller knowledge of larval habits and larval structure would help us to an understanding between the Thaines and the *Aristolochia*-feeding Papilionines, but, in such a matter, structure is more important than habit, which, however, may give excellent indications. Even whilst this chapter is going through press, Floersheim writes that he has already noticed how the imagines of non-pharmacophagous Papilionid species have a tendency to lay their eggs on *Aristolochia* when the neighbourhood of their proper foodplant is wanting. He reports that he watched both *Iphiclides ajax* and *Jasoniades glaucus* (*turnus*) do so this year. He adds that he could not get the latter to oviposit on cherry, birch, or plum, although these trees are accounted among its favourite foodplants, the species preferring *Ptelea*, and, when it could not find this, chose *Aristolochia*; the young larvæ tried to eat the latter, but died during ecdysis. The larvæ of *I. ajax* also tried to feed on *Aristolochia*, but it killed them at once. Such indications as these are, however, very suggestive. Considering the great attention that has been paid to collecting the Papilionids, it is much to be regretted that so little time has been spent on the early stages, and that, of the many species whose larvæ are known, so little has been recorded of their habits. Still this chapter may serve as a peg on which some future worker will be able to hang a much more illuminating thesis on the larval habits of this delightful and attractive superfamily of butterflies.

PLATE I.

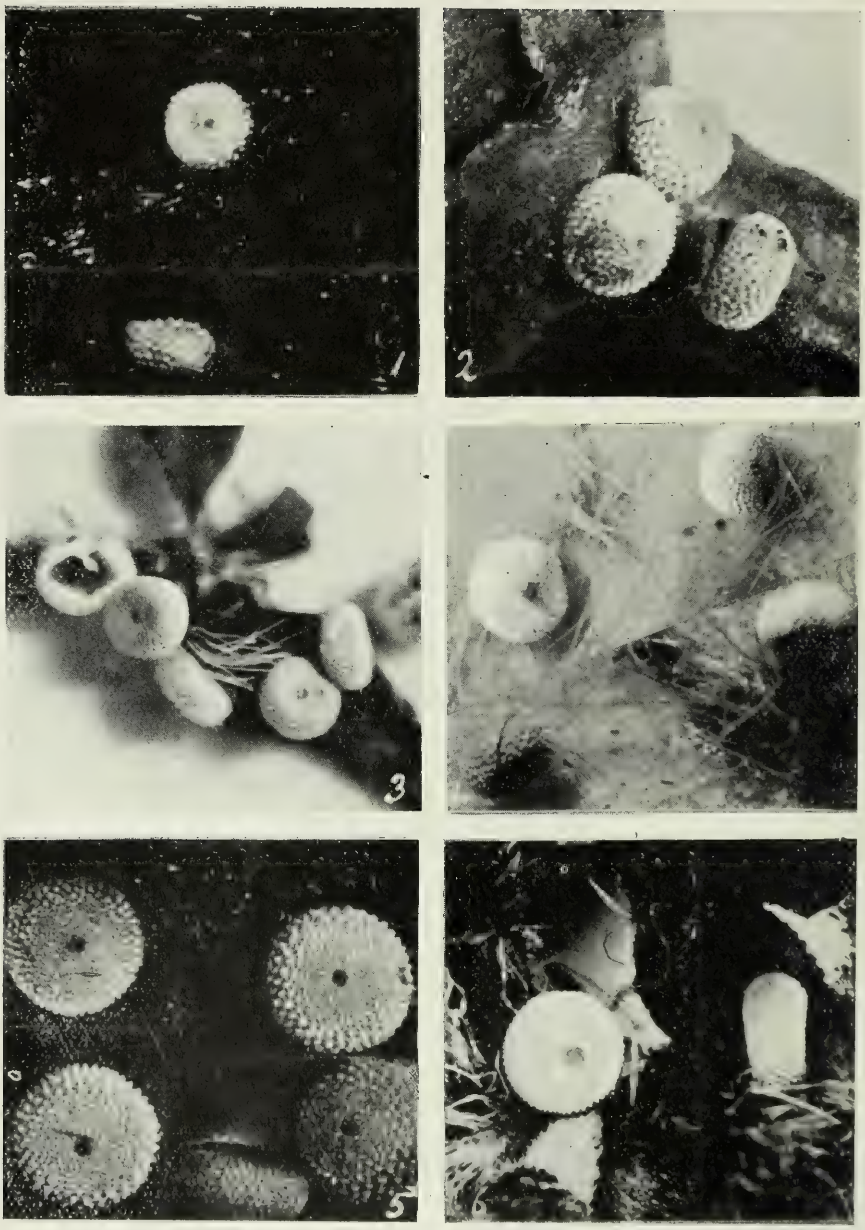


Photo. A. E. Tonge.

EGGS OF BRITISH LYCÆNIDS (× 20).

1. LAMPIDES BOETICUS. 2. CELASTRINA ARGIOLUS. 3. EVERES ARGIADES.
4. CUPIDO MINIMUS. 5. PLEBEIUS ARGUS (ÆGON). 6. LYCÆNA ARION.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 41].

Superfamily II: RURALIDES.

Family: RURALIDÆ.

Subfamily: LYCÆNINÆ.

Tribe: EVERIDI.

We have already, in the preceding volume, dealt with two tribes of the subfamily *Lycaeninae*, *viz.*, the *Lampididi* and *Celastrinidi.* Although it might be advisable, on some phylogenetic grounds, to deal next with the main tribe of "blues," the *Plebeiidi*, there are others that make it at least convenient to follow with the *Everidi.*

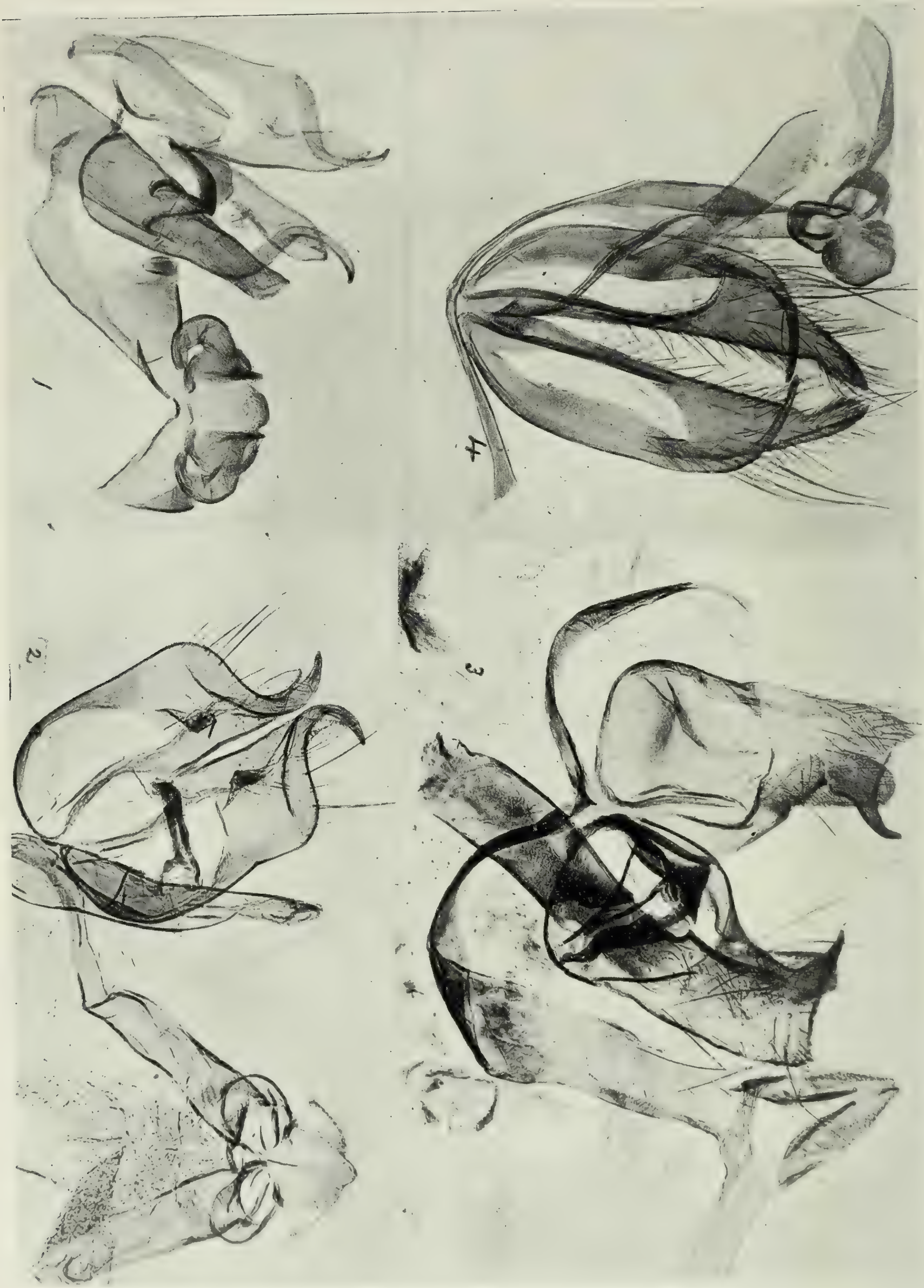
The oldest plural name used for the members of this group of small, and often delicately-tailed, "blues" is Hübner's *Everae* (*Verz.*, p. 69), hence our tribal name *Everidi.* As at present constituted, we restrict the name to three very limited Palæarctic genera, *Everes* (type *argiades*), *Cupido* (type *minimus*), *Tongeia* (type *fischeri*), which show, in many respects, very close alliance, together with *Bothria* (type *chennellii*), *Binghamia* (type *parrhasius*), and possibly some others outside the Palæarctic region. Staudinger includes (*Cat.*, 3rd ed., p. 77) these Everid genera in his heterogeneous group, *Lycaena*—comprising almost the whole of the Palæarctic "blues," whilst Meyrick includes them, with many other discordant elements, in his genus *Chrysophanus.*

Absence of sufficient material of the early stages makes it difficult to work out the characters of this tribe at all satisfactorily. The general features, however, of the egg, larva, and pupa, suggest that *Everes* and *Cupido* are closely allied, and this is abundantly supported by the genitalic characters. Moore's treatment of the *Cupido* group, however, seems to be at fault. He instituted the genus *Zizera* for certain small Indian Lycænids, which he considered closely allied to our Palæarctic *minimus*, fixing, indeed, the latter as the type of the genus. To this, however, Chapman takes objection, and observes that not only has *minimus* nothing really in common with the Indian species with which he groups it, but that the Indian section is Celastrinid in its affinities, and not Everid, as is *minimus.* He says (*in litt.*): "Taking *maha* as a type of the eastern species with which Moore was dealing, we find that these belong to the Celastrinid section of the Lycænids, whilst *minimus* belongs to the Everids. The '*maha*' group disagrees with '*minimus*' in having the costal and subcostal nervures of the forewing just touching and not anastomosing, and this is a character that unquestionably has its value in classifying these species, and indicates a difference of affinity. *Everes* presents the same characters as *minimus*, but has not been associated with *Zizera* by any systematists so far as I know; *Zizera* (*i.e.*, *maha*, etc.) has, however, been rightly regarded by de Nicéville and others as closely related to *Celastrina*, in which these two nervures are quite separate. The ♂ ancillary appendages show, at once, however, that *Everes* (*argiades*) and *Cupido* (*minimus*) are closely related, whilst *Cupido* (*minimus*) and *Zizera* (*maha*) have nothing in common, but that the latter (*maha*, etc.) is of the same general type as *Celastrina*. The ancillary appendages of *Everes* and *Celastrina* differ both in the dorsal armature and in the clasps. *Everes* has a median dorsal armature with a definite uncus, *i.e.*, the chitinous ring (9th abdominal segment) is wide and produced in the actual dorsal line, whilst *Celastrina* has a dorsal armature formed of two lateral halves, and the ring is reduced in the actual dorsal line to small dimensions. The clasps which, in the Plebeiids (*e.g.*, *corydon*), present a terminal division into a spinous (hard) and hairy (soft) process, have, in *Everes*, these two branches each well, and equally, developed, so as to be of an obviously bifid character, the process being of nearly half the length of the clasp (in the Plebeiid type, the actual division affects only the end of the clasp, though their bases affect more or less a great part of the body of the clasp), even more than this in *Bothria chennellii*, the extreme instance with which I happen to be acquainted. In *Celastrina* the spinous part of the clasp only is developed, the soft process being, one may say, only 'theoretically' present in a few species, most clearly, perhaps, in *Celastrina argiolus*."

These genitalic characters are similar in *Everes* (*argiades*) and *Cupido* (*minimus*), and the relationship here suggested is borne out by other characters, particularly in the hairy pupa of both, the almost identical character of the larval habits, not only hybernating when full-grown and waiting until the following year to pupate, but also in the seed-feeding habit, whilst the eggs are also very similar. [It may be well to note that *Cyaniris semiargus*, usually supposed to have close affinities with *Cupido minimus* really belongs, as shown in all its stages, to the Plebeiid, and not to the Everid, branch of the Lycænids.] Chapman further notes that "the genitalia show that the Everids and the Celastrinids are quite different developments of the Lycænids, and have the whole of the Plebeiids between them in this particular, so that the anastomosis of the costal and subcostal nervures must have a quite different significance in the two groups, *i.e.*, they have almost certainly originated separately. In *Celastrina*, these veins approach, in *Zizera* they just meet, whilst in all the Everids I have the anastomosis is complete."

Close as *parrhasius*, Fab., appears to be to *argiades*, Pall., it is certain that it is generically distinct; its genitalic structures are farther from those of *argiades*, than are the latter from those of *Cupido* (*minimus* and *sebrus*), and we have provisionally placed it in *Binghamia*, n. gen. The species *fischeri*, Evers., which is generally closely attached to *argiades*, and by most authors included with it in the genus *Everes*, is an Everid, but no doubt also quite distinct generically; *ion*, Leech, *zuthus*, Leech, *filicaudis*, Pryer, *davida*, Pouj., *potanini*, Alph., etc., also appear to belong to the same genus = *Tongeia*, n. gen.

Chapman notes (*in litt.*): "The Everid type of ♂ ancillary appendages may be described as being characterised by the dorsal region (tegumen and uncus) being well-developed longitudinally, *i.e.*, the width (longitudinally) of the chitinous ring formed by the 9th abdominal segment (with 10th ?) is greatest in the actual dorsal line, and in the two portions of the clasp being fairly equally developed and the division between them being well marked and often deep." He has also kindly given us the following summary of the peculiarities of the ♂ ancillary appendages exhibited by the various genera which we



A Natural History of the British Butterflies, etc., 1909. *Photo. F. N. Clark.*

COMPARATIVE VIEW OF ANCILLARY APPENDAGES OF THE GENERA (1) CUPIDO (MINIMUS), (2) EVERES (ARGIADES), (3) TONGEIA (FISCHERI), (4) BINGHAMIA (PARRHASIUS) (ALL × 45).

(*To face p. 43.*)

have felt compelled to create to get an understanding of the relationships of the species considered :—

Cupido (type *minimus*) : Tegumen somewhat rounded, apex blunt (or flat), spicular branch of clasp long and slender ; ædœagus broad and less than 1mm. long ; ædœagus support bent at right angles at the fork (in all the other genera it is straight or nearly so).

Everes (type *argiades*) : Tegumen broad, apex sharp (*argiades*) or broad (*dipora*) ; spicular branch of clasp tapering, shorter than in *Cupido* ; ædœagus support straight, branched in *argiades* much as in *Cupido*, in *dipora* it is rather a flat wide plate with short ears instead of branches; ædœagus narrower and longer (over 1 mm.) than in *Cupido*.

Tongeia (type *fischeri*) : This genus (so far as examined—*fischeri*, *ion*, *zuthus*) is readily recognised by the long narrow tegumen, rather longer than broad, and with straight sides tapering to a sharp point, with indication of a median division ; the lateral, softer, hairy margins, that, in the other genera, seem to float off at each side as soft loose wings, appear here to be part of the solid tegumen, and give the whole organ a striking resemblance to the nose of a rat with its whiskers ; the lateral branches or parameres, instead of being curved with varied flanges, are here (except the basal curve) straight, with a terminal expansion like a button on a foil ; the branches of the ædœagus support are long and slender ; the ædœagus itself (about 1mm. long) has a marked raised zone (present, however, but less marked in the others) where supported ; the spicular branch of the clasps is much modified, the "shoulder," rounded and retreating in the other genera, is here advanced, projecting as far as, or further than, the apex, and the hollow margin between is more or less spiculate along its whole length.

Binghamia (type *parrhasius*) : Tegumen small, rounded, the apex minute, retracting, almost as if absent ; ædœagus short (·7mm.) : branches of support very long ; the spicular branch of clasp narrow and slender, sweeping inward with a regular curve, the apex pointing transversely, the soft branch extending beyond it about one-sixth of the length of the clasp ; the "spicular" branch is smooth and without spicules or hairs, the result is that the two clasps together (in ordinary preparations) have a regular oval outline quite unlike the other genera.

Bothria (type *chennellii*) :—The two branches of the clasps rather similar to each other, very long and parallel.

Genus : Everes, Hübner.

Synonymy.—Genus : **Everes,** Hb., "Verz.," p. 69 (*circ.* 1818) ; Scudd., "Sys. Rev.," p. 35 (1872); "Butt.," pp. 152, 158, 302-308, fig. 125 (1881); Moore, "Lep. Ceyl.," i., p. 85, *in part*, pl. xxxvi., fig. 7 (1881); Butl., "Ann. Mag. Nat. Hist.," 5th ser., ix., p. 17 (1882) ; Dist., "Rhop. Mal.," p. 221, *in part*, (1884) ; Dohrty., "Journ. As. Soc. Beng.," lv., pt. 2, p. 132 (1886); Scudd., "Butts. New Engl.," ii., p. 911, pl. vi., figs. 9-10 (1889) ; de Nicév., "Butts. Ind.," iii., p. 137, *in part*, pl. xxvi., fig. 180 (1890); Leech, "Butts. China," ii., p. 328 (1894); Tutt, "Ent. Record," vii., pp. 220, 300 (1896); "Brit. Butts.," p. 185, pl. ii., fig. 5 (1896); "Ent. Rec.," ix., p. 254 (1897); Reut., "Ent. Rec.," x., p. 97 (1898); Wheel., "Butts. Switz.," p. 44 (1903); Tutt, "Ent. Rec.," xviii., p. 131 (1906) ; Bingham, "Fauna Ind.," ii., p. 377, *in part* (1907). **Papilio,** Pall., "Reisen," etc., p. 472 (1771); Schiff., "Schmett. Wien.," 1st ed., ii., p. 274 (1775); Schneid., "Syst. Besch.," p. 260 (1787); Scriba*, "Journal," p. 221 (1791); Bork., "Rhein. Mag.," p. 292 (1793); Hb., "Eur. Schmett.," pl. lxv., figs. 319-321, 322-4 (1799); Ill., "Schmett. Wien.," 2nd ed., p. 274 (1801); Hoffmansegg, "Ill. Mag.," iii., p. 185 (1804); Herbst, "Nat. Sys. Ins.," xi., pp. 73, 77 (1804); Hb., "Eur. Schmett.," text, p . 51 (1805 ?) ; Ochs., "Die Schmett.," i., pt. 2, pp. 59, 60, 61 (1808). **[Papilio-, Plebeius-] Ruralis,** Rott., "Naturf.," vi., p. 23 (1775); Esper, "Schmett. Eur.," i., pt. 1, p. 337 (1779) ; pl. xxxiv., figs. 1-2 (1777); Bergstr., "Nomen.," ii., pp. 72, 73, pl. xliv., figs. 3-5 (1779); Fab., "Spec. Ins.," ii., p. 133 (1781); "Mant. Ins.," ii., pp. 70, 76 (1787); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 75 (1789); Bkh., "Sys. Besch.," i., p. 166 (1788); ii., p. 232 (1789) ; Brahm, "Ins. Kal.," p. 386 (1791); Rossi, "Mant.," ii., p. 12 (1794). **[Hesperia-] Ruralis,** Fab., "Ent. Sys.," iii., pt. 1, pp. 285, 289 (1793). **Cupido,** Schrank, "Faun. Boica," ii., pt. 1, p. 215 (1801) ; Kirby, "Syn. Cat.," p. 356 (1871); Scudd.,

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* Scriba does not really call the butterflies *Papilio* ; he gives only the specific names, and calls them all "Tagfalter."

"Hist. Sketch," p. 149 (1875); Snell., "Tijd. voor Ent.," xxi., p. 19 (1878); Kirby, "Handbook," etc., ii., p. 85, pl. xlv., figs. 4-6 (1896); South, "Brit. Butts.," i., p. 156, pl. ciii., figs. 4-7 (1906). **Lycaena,** Oken, "Lehrb.," ii., p. 720 (1815); Ochs., "Die Schmett.," iv., p. 26 (1816); Horsf., "Cat. Lep. E. Ind. Co.," p. 86 (1829); Treits., "Die Schmett.," x., supp. i., pp. 72, 237 (1834); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); Hch.-Sch., "Sys. Bearb.," i., p. 129 (1843); Evers., "Faun. Volg.-Ural.," p. 56 (1844), Koll., "Hügel's Kaschmir," p. 421 (1844); Dup., "Cat. Méth.," p. 31 (1844); Sél.-Long., "Mém. Soc. Sc. Liège," pt. ii., pp. 3, 31 (1845); Doubleday, "List Lep. Brit. Mus.," ii., pp. 43-4 (1847); Hdrch., "Lep. Eur. Cat. Meth.," p. 15 (1851); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 490 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 19 (1852); Mén., "Cat. Lep. Mus. Petr.," p. 55 (1855); Horsf. and Moore, "Cat. Lep. E. Ind. Co.," i., p. 22 (1857); Spyr., "Geog. Verb.," i., p. 250 (1858); Staud., "Cat.," 1st ed., p. 4 (1861); Feld., "Verh. zool.-bot. Ges.," xii., p. 489 (1862); Feld., "Reis. Nov. Lep.," ii., p. 281, pl. xxxv., fig. 5 (1865); Moore, "Proc. Zool. Soc. Lond.," p. 506, pl. xxxi., fig. 8 (1865); Snell., "De Vlind.," i., p. 61 (1867); Berce, "Faun. Franc.," i., p. 133 (1867); Butl., "Cat. Diurn. Lep.," p. 169 (1869); Staud., "Cat.," 2nd ed., p. 9 (1871); Curò, "Bull. Soc. Ent. It.," vi., p. 109 (1874); Edw., "Can. Ent.," viii., pp. 202-5 (1876); Frey, "Lep. Schweiz," p. 14 (1880); Elw., "Proc. Zool. Soc. Lond.," p. 887 (1881); Rössl., "Lep. Wiesb.," p. 29 (1881); Middl., "Lep. Ins. Ill.," x., pp. 95-6 (1881); Lang, "Butts. Eur.," p. 101, pl. xxii., fig. 5 (1884); Fern., "Butts. Maine," pp. 91-3, fig. 32 (1884); Kane, "Eur. Butts.," p. 35 (1885); French, "Butts. East. Unit. States," pp. 292-4, fig. 81 (1886); Mayn., "Butts. New Eng.," p. 40, pl. v., figs. 50-50*a* (1886); Leech, "Proc. Zool. Soc. Lond.," p. 415 (1887); Auriv., "Nord. Fjär.," p. 15, pl. vi., fig. 11 (1888-91); Pryer, "Rhop. Nihon.," p. 17, pl. iv., figs. 23*a*-*b*(1888); Barr., "Lep. Brit. Isl.," i., p. 68, pl. x., figs. 2-2*b* (1893); Rühl, "Gross.-Schmett.," p. 223 (1892); Staud., "Cat.," 3rd ed., p. 77 (1901); Lamb., "Pap. Belg.," p. 219 (1902). **Polyommatus,** Latr., "Enc. Méth.," ix., p. 607 (1819); Godt., "Pap. Fr.," i., p. 194, pl. ix. sec., fig. 2, ter. fig. 5 (1821); "Enc. Méth.," ix., pp. 659, 660 (1819); Bdv., "Eur. Lep. Ind.," p. 11 (1829); Meig., "Eur. Schmett.," ii., pp. 13-15, pl. xlv., figs. 4*a*-6*b* (1830); Hein., "Schmett. Deutsch.," i., p. 85 (1859); Durban, "Can. Nat.," v., p. 246 (1860); Kirby, "Man.," p. 99 (1862); Morr., "Syn. Lep. N. Amer.," p. 83 (1862); Har., "Ins. Inj. Veg.," 3rd ed., p. 275 (1862); "Entom. Corr.," p. 275 (1869); Kirby, "Eur. Butts.," p. 53, pl. xiv., fig. 11 (1882); Dale, "Brit. Butts.," p. 53 (1890). **Argus,** Dup., "Pap. Fr.," supp. i., p. 388 (1832); Bdv. and Le Conte, "Lep. Am. Sept.," p. 120, pl. xxxvi., figs. 6-9 (1833). **Lampides,** Butl., "Cat. Diurn. Lep.," p. 164 (1869); Semp., "Journ. des Mus. Godef.," xiv., p. 54 (1878). **Plebeius,** Kirb., "Syn. Catal.," p. 653 (1871). **Chrysophanus,** Meyr., "Handbook," etc., p. 345 (1895).

Our knowledge of the characters of the various forms referable to this genus is so defective that we have detailed at length the whole of the synonymy that may probably be referred to the genus, *i.e.*, including the eastern Asiatic and American forms, so that students who wish to go into the matter more deeply may find here means of ready reference to the literature. We had at first made up our mind to include most of the Asiatic and all the American forms under the specific name "*argiades*," but, Chapman's work with the genitalia has led us to modify this procedure. We propose, however, to deal with most of them, but not at so great length. In the present state of our knowledge the species that certainly belong to *Everes* appear to be *E. argiades*, Pall., *E. alcetas*, Hoffmansegg, and *E. dipora*, Moore, and probably some American species allied to *E. comyntas* and not yet described.

Having thus stated that very little is known of the small, delicately-tailed insects that are comprised in the genus, and that the species are by no means capable of very clear differentiation, it will be readily understood that, so far as the genus is concerned, its limits are strikingly curtailed and the generic elements peculiarly homogeneous.

The group was first separated by Hübner, who applied the generic name *Everes* (*Verz.*, p. 69) to the species, and described it as follows:—

> The hindwings delicately tailed; all the wings beneath bluish-white marked with black—*Everes amyntas*, Schiff., "Verz.," Pap. n. 18 (*tiresias*, Esp., "Pap.," xxxiv., figs. 1-2; Hübn., "Pap.," figs. 322-4).* *E. polysperchon*, Bergstr., "Nom.," pl. xliv., figs. 3-5 (*tiresias*, Hb., "Pap.," figs. 319-321).

Staudinger includes (*Cat.*, 3rd ed., p. 77) the species of this genus in his heterogeneous group *Lycaena*, whilst Meyrick places it in his amazing genus *Chrysophanus*, which contains all the smooth-eyed Lycænines and Chrysophanines. On the other hand, Scudder, Moore, Butler, de Nicéville, Leech and others, have fully recognised the essential differences between this genus and the Plebeiid Lycænids, and treat it separately.

There can be no doubt as to the validity of Hübner's name for the genus. The two species he mentions, *amyntas*, Schiff., and *polysperchon*, Bergstr., are merely forms of the same species. Hübner's *amyntas*, referred to in the synonymy, agrees, as he notes, with *amyntas*, Schiff.; but his *tiresias* is not, as he writes, the same as *polysperchon*, Bergstr., but was named *alcetas*, Hoffmansegg. The species here called *amyntas*, Schiff., and its var. *polysperchon*, Bergstr., are merely forms of the species now known as *argiades*, Pallas. There is, therefore, no question that this is the type of the genus, as indicated by Scudder, in 1872, in his *Syst. Rev. of Nth. Amer. Butts.*, p. 35, and, in 1875, in his *Historical Sketch*, p. 176. The only doubt that has ever arisen in the matter has been due to Kirby's action in 1896, when, in his *Handbook to the Order Lepidoptera*, ii., p. 85, he notes *argiades* as the type of Schrank's much older *Cupido*, thus practically reducing *Everes* to a synonym with the same type; but this action is altogether *ultra vires* for, in 1870, Kirby had already stated (*Journ. Linn. Soc. Zool.*, x., p. 499), that the true type of *Cupido* appeared to be "*alsus* (*minimus*)," a position which he emphasised in a letter to Scudder, and which was published by the latter (*Historical Sketch*, p. 293) in 1875. The whole of Kirby's later action is, therefore, as stated, *ultra vires*, and *minimus* must remain, however fanciful and far-fetched we may consider the original reason for making it so, the type of *Cupido*, leaving *Everes* quite unaffected by any later action. This was evidently Scudder's view when he retained *Everes* for *comyntas* (an American insect hardly, if at all, differentiable from our European species *argiades*), as also that of Moore, Butler, Doherty, Distant, de Nicéville and Leech, who used it for the eastern forms of *argiades*, and the allied species. Scudder, indeed, describes (*Butts. New England*, ii., pp. 905 *et seq.*) the genus, under the name *Everes*, as follows:—

> Imago: Head small, densely covered with scales, recumbent on the front, more erect above, and tufted slightly about the base of the antennæ; provided also sparsely with longer, but still rather short, hairs, nearly erect above, curved downward in front. Front nearly flat, slightly sunken above, a very little bulbous below, barely protruding beyond the front of the eyes, twice as high as broad, scarcely two-thirds as broad as the eyes on a front view, the sides parallel, the upper border squarely docked, its angles hollowed in front of the antennæ, the lower border well rounded. Vertex scarcely vaulted, with a scarcely perceptible ridge running from the middle

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* This is correct as a quotation from Hubner's *Verzeichniss*, but, in point of fact, Hubner's figs. 322-324 are called *amyntas*, and figs. 319-321 on the same plate are called *tiresias*.

of the hind border to the nearest point of the antennæ, to which it acts as a support, and separated from the occiput by a nearly straight, rather deep groove, with walls sloping toward each other at considerably more than a right angle, the posterior the more abrupt. Eyes not large nor full, naked in every part. Antennæ inserted in the middle of the summit, separated by a space equal to the width of the basal joint; barely longer than the abdomen, composed of about thirty-two joints, of which the last twelve form a depressed, elongate club, the first three of which broaden rather rapidly, but beyond them the club remains equal or even diminishes very slightly, the bluntly conical tip composed of three or four joints: the club is three times as broad as the stalk, and about four times as long as broad. Palpi slender, compressed, tapering, less than twice as long as the eye, the apical joint three-fifths as long as the penultimate, and provided only with recumbent scales; other joints also furnished beneath with a curving fringe of very long, thick scales; all closely compressed in a vertical plane. Patagia slender, arched longitudinally, but scarcely tumid, very small, about two-and-a-half times longer than broad, tapering gradually and regularly, with straight sides on the basal two-thirds, beyond which they are equal, bent slightly outward, so that the whole inner margin is about straight, and bluntly pointed. Forewings two-thirds as long again as broad, the costal margin very gently convex, less so beyond the base, the outer angle scarcely rounded off, the outer margin rather broadly and regularly rounded, having a general direction of about 55°-60° with the costal margin, the inner margin straight, the angle rounded. Costal nervure terminating opposite the middle of the outer half of the cell, confluent for a part of the time with the first superior subcostal nervure; subcostal nervure with three superior branches; the first, arising scarcely beyond the middle of the upper margin of the cell, runs at first into the costal, is completely confluent with it for a short distance, and then parting from it, ends on the margin opposite the apex of the cell; second superior branch arising at about one-fourth the distance from the origin of the first to the apex of the cell; and the third at a little more than half way from the origin of the second to the apex of the cell, forking before the middle; cross veins closing the cell exceedingly faint and transverse, bent at a slight angle; cell scarcely half as long as the wing, and three-and-a-half times longer than broad. Hindwings with the costal margin well curved, more strongly on the basal than the apical half, the outer border strongly rounded, very full on the upper half, and perhaps rather more so in the ♂ than in the ♀, the medio-submedian interspace very slightly and roundly emarginate, the lower median nervule finished with a very slender, thread-like tail, considerably longer than the width of the interspaces at its base; inner margin rather strongly convex near the base, beyond straightly excised, the angle abrupt but broad. Submedian nervure terminating at the anal angle; internal nervure terminating at about the middle of the inner border. Androconia rounded quadrate, the stem less than half as long as the lamina. Fore tibiæ three-quarters the length of the hind tibiæ; fore tarsi not so crowded with spines as on the other legs, scaled beneath, the tibial spurs naked and small, smaller in the ♂ than in the ♀; the terminal joint is either like that of the other legs (♀), or it is furnished at tip with only a single, median, long, tapering, scarcely curving hook, without paronychia or pulvillus (♂). Middle tibiæ a little shorter than the hind pair, provided at tip with long and slender tapering spines, mostly concealed by large scales. First joint of tarsi as long as the others combined, the second, third, and fourth diminishing regularly in size, the fifth equal to the second; the terminal joint furnished beneath with two, the other joints with three rows of moderately long and slender spines, the terminal outer ones of each joint much longer than the others, spur-like and curved; claws very small, short, gently curved, tapering but little, pointed; paronychia double, the upper piece long and very slender, tapering, almost filiform, incurved, and delicately pointed, the lower piece a ciliate lobe, hardly longer than broad, and rounded; pulvillus wanting. Upper organ of male abdominal appendages forming a short, semicircular, laminate hood, the edges setose, the posterior margin entire; lateral arms slender, very long and strongly arcuate; clasps forming a not very long, subequal, somewhat bellied ribbon, broadly rounded apically.

Egg: Very depressed echinoid-shaped, the whole upper surface almost perfectly flat, flatter above than in *Cyaniris* (*Celastrina*), and not so high for its breadth; covered with moderately prominent, and not crowded tubercles, connected by fine raised lines forming subquadrate or rhomboid cells, but with no subordinate tubercles, the micropyle not sunken.

Caterpillar at birth: The head is as broad as the body, or barely narrower than the first thoracic segment; frontal triangle large, more than half as high as the head, nearly as broad at base as high. Body subcylindric, scarcely tapering from in front backward, the first considerably larger than the other thoracic segments, furnished with rather shorter bristles than the rest of the body, few in number, and regularly disposed. The other segments have regularly disposed appendages as follows:—A subdorsal series of high papillæ and long, tapering hairs, as long as the width of the body, on the thoracic and first eight abdominal segments, a little in advance of the middle; a laterodorsal series of small papillæ with shorter hairs, on the same segments, centrally situated; a laterostigmatal series of high papillæ with comparatively short truncate (but not clubbed) bristles, on the first six abdominal segments, two to a segment, one anterior and a little lower with slightly longer bristle, the other posterior and higher. There is also a similar, but longer, infralateral bristle, anteriorly placed, on the third thoracic segment; and an infrastigmatal series of long hairs, three to a segment, of which one is central, on a high papilla directly on the substigmatal fold, and the others are on lower papillæ, one a little lower and anterior, the third above it and posterior. There are also series of hairless lenticles or annuli, as follows:—A supralateral series on the thoracic and sixth and seventh abdominal segments, the former large, the latter small; a lateral series, large on the first eight abdominal segments, a small, infralateral one on the fourth abdominal segment (and on all the segments a small suprastigmatal series, and on the abdominal segments a small infrastigmatal series; these last I have been unable to verify since my notes were made). All hairs and bristles are microscopically spiculed.

Mature caterpillar: Head hardly more than one-tenth the width of the body. Body longitudinally arched, more abruptly curved in front and behind, more strongly in front than behind, but in the middle with a narrow dorsal field and tectiform sides, the incisures deeply cut. On most of the segments there is a subdorsal group of spiculiferous hairs, which in the earlier stages are sub-equal, long, erect, and forward curving, but later are unequal, a single longer one curving outward, the shorter ones erect. The crateriform annuli of the first stage continue at least into the next; full notes were not taken. The caterpillar differs from that of *Cyaniris* (*Celastrina*) in the great breadth and flatness of the last abdominal segment, and in the more lateral position of the caruncles of the eighth abdominal segment.

Chrysalis: Long and slender, nearly four times as long as broad, the sides, viewed from above, parallel and straight from the base of the wings to their tip, beyond which the abdomen tapers a very little and ends in a long elliptic curve. Viewed laterally, the abdomen is highest at the third and fourth abdominal segments, and is very broadly and regularly arched; and, although not high, the upper part of the ninth segment is perpendicular; transversely the abdomen is regularly rounded, forming perhaps a little more than a semicircle; three-fourths of the tongue exposed, the inner edges of the legs resting against it; basal wing prominence apparently altogether absent; surface of the abdomen transversely, coarsely and infrequently striated, particularly on the hinder part of the segments and with very distant minute warts, perhaps 15-20 on the dorsum of a single segment, giving rise to long, nearly equal apically tapering, pretty slender hairs. Similar hairs are found all over the thorax, where they are slightly longer. The body, says Dr. Harris, is slightly contracted laterally before the middle, broadest behind the middle, more obtuse before than behind, and the thorax projects slightly above.

The Everid neuration is described by de Nicéville (*Butts. India*, iii., p. 136) (after Moore *Lep. Ceyl.*, i., p. 85) as follows:—

Forewing: Costal nervure short, bent slightly upward before reaching the costa, and not extending to half length of the margin; the first subcostal nervule ascending and anastomosed to the costal nervure near its end; the second subcostal at one-third before the end of the cell; third subcostal at one-sixth before its end; the fourth subcostal from one-half length of the third and terminating at the apex; the fifth subcostal (upper discoidal) from the end of the discoidal cell; the discocellular nervules slightly oblique; the radial (lower discoidal) nervule from their middle; the second median nervule emitted at one-sixth before the end of the cell, the first median at one-half before its end; the submedian nervure slightly recurved. *Hindwing:* With a slender tail from the end of the first median nervule: the costal nervure extending to near the apex, arched at the base; upper discocellular nervule oblique, lower discocellular erect, discoidal nervule from their middle; discoidal cell short; second median nervule emitted before the end of the cell, first median at one-half before its end; submedian and internal nervures straight. (Moore.)

Of this de Nicéville remarks (*Butts. India*, iii., p. 136): "The costal nervure, especially in the ♂, is very short, and anastomoses with the first subcostal nervure for some little distance; the second subcostal is emitted rather nearer to the base of the first than to that of the upper discoidal nervule; the third subcostal originates nearer to the base of the upper discoidal than to the apex of the wing; there is no upper discocellular nervule; the middle discocellular is straight, outwardly oblique, the lower discocellular also straight, but inwardly oblique."

Our ignorance of the detailed structure of the early stages of the species of this group leaves us in darkness as to the generic peculiarities of the egg, larval, and pupal stages, except so far as they have been worked out by Scudder (*anteà*, pp. 46-47).

Scudder says (*Butts. New Engl.*, ii., p. 908) that the Everid caterpillar is elliptical in form, flatter and more elongated than the Cyanirid (*i.e.*, Celastrinid) larva, with a flatter terminal segment, of a greenish colour, with a dark dorsal stripe and many oblique lateral lines. Of the pupa he adds (*op. cit.*, p. 909) that "the chrysalids are longer and slenderer than those of the Cyanirids (*i.e.*, Celastrinids), being nearly four times longer than broad, the abdomen but slightly more elevated than the thorax, and the whole body covered with long distant hairs, by which they may readily be distinguished; in colour they resemble the larvæ, or are darker and spotted with black."

The imago is easily recognised by the presence of its slender fringe-tail, at the tip of the lowest median nervule of the hindwing, in which it resembles the Lampidid and allied genera, rather than the Plebeiids with which its general structural characters incline to relate it. The sexual difference is most marked, the ♂s blue, the ♀s fuscous, although sometimes tinged with blue towards the base. There is also considerable seasonal dimorphism sometimes shown, the spring broods averaging less in wing-expanse than the summer brood, the third or autumnal brood often not being larger than the spring brood. The delicate silvery-white or silvery-blue underside with rather elongated dots, resembles those of the Celastrinids and the species of the allied genus *Cupido* more than any other "blues," and, although some species have the ground colour pale brown-grey, this general similarity is not altered. The presence of dark black spots above the tail, surmounted above by orange, and sometimes kernelled with metallic blue, reminds one rather of the Plebeiids (*sens. rest.*) *e.g*, *Plebeius aegon*, and *P. argus* (*argyrognomon*), etc., but so marked are the general features that one is not likely to mistake the Everids for the allied species. Scudder says (*Butts. New Engl.*, ii., p. 908), that "beneath, the imagines are very pale brown, with faint marginal markings over most of the outer border; these markings on the hindwings are intensified in the median interspaces, forming, especially in the lower one, a blackish spot surmounted by a bright lunule; there is also an extra-mesial series of blackish spots or dashes, nearly straight, on the forewing, strongly tortuous on the hindwing, besides a transverse dash at the tip of the cell, and, on the hindwing, a couple of round spots near the base."

Little is known of the larval habits of the species of the genus.

They are reputed to be almost the same as those of the species of *Cupido*, the larvæ curving themselves round on the outside of the flowers to which they are attached, and to which their colours bear considerable resemblance, gnawing a hole through the flower into the seed-vessel and clearing out the contents, by no means, however, refusing the floral leaves (petals and sepals), or even the tender foliage leaves, if hard pushed, but they certainly seem to confine themselves largely to the flowers. Their food-habit seems to be largely to restrict themselves to leguminous plants, and, like the larvæ of *Cupido*, they appear to hybernate nearly or quite full-fed. Like most of their allies, the larvæ are remarkably sluggish throughout their lives. The young larvæ also bear considerable cryptic resemblance to their foodplants (see preceding vol. p. 71). The habit of producing "forwards" is usually highly developed. Scudder observes (*Butts. New Engl.*, ii., p. 908) that the butterflies are polygoneutic, the Palæarctic, and probably the Nearctic, species hybernating in curled leaves as fully-grown larvæ, transforming into chrysalids in May, about a fortnight before the first brood of butterflies appears. "The duration of the egg is only three or four days; the larvæ mature rapidly and the summer chrysalids evolve their inmates more quickly than those of spring. The larvæ feed on a variety of leguminous plants, the European species having been found on *Lotus*, *Anthyllis*, *Medicago*, *Trifolium*, *Pisum* and *Onobrychis* [and even on *Rhamnus*], whilst the American feed on *Lespodeza*, *Phaseolus*, *Desmodium*, *Galactia*, *Trifolium*, and *Astragalus*. The caterpillar of the European species is known to bore the husks and devour the seeds of *Pisum*, and an entirely similar habit has been discovered in the Californian *amyntula*, by Wright and Riley, the latter of whom writes that the larva of *amyntula* lives within the pod of *Astragalus leucopsis*, etc."

Scudder's general statement (*Butts. New Engl.*, ii., p. 908) that "the transformations of several species are known," is rather misleading. Of the species included in *Everes*, practically only the general facts relating to the life-histories of *E. argiades* and *E. comyntas* have been published. Of the others we seem to be in total ignorance.

The way in which the eastern Asiatic species have been treated by authors leaves us in some doubt as to the actual range of the different forms, and little enough is known of the American ones. Dyar mentions as distinct *E. comyntas*, *E. amyntula*, and *E. monica*, for the Nearctic region. De Nicéville treats (*Butts. of India*, iii., p. 137), *dipora*, Moore, *praxiteles*, Feld., *hellotia*, Mén., *parrhasius*, Fabr., *comyntas*, Godt., *glandon*, Prun., *puer*, Schrank, *alcetas*, Hb. (*coretas*, O.), as co-specific with *argiades*, Pall., as well as the recognised synomyms *amyntas*, *tiresias*, and *polysperchon;* whilst he notes three other uncertain species—*E. exiguus*, Dist., described from a single ♀ taken at Singapore [and which de Nicéville (*op. cit.*, p. 141) believes to be *Catochrysops strabo*]; *E. kala*, de Nicév., described from a single example taken at Shillong, and stated to be possibly co-specific with *fischeri*, from which, however, it is very distinct; and a third species, *E. umbriel*, Dohty., also from a single ♂ taken in Burma = *potanini*, Alph. (*teste* Bingham, *Faun. Ind.*, ii., p. 379).

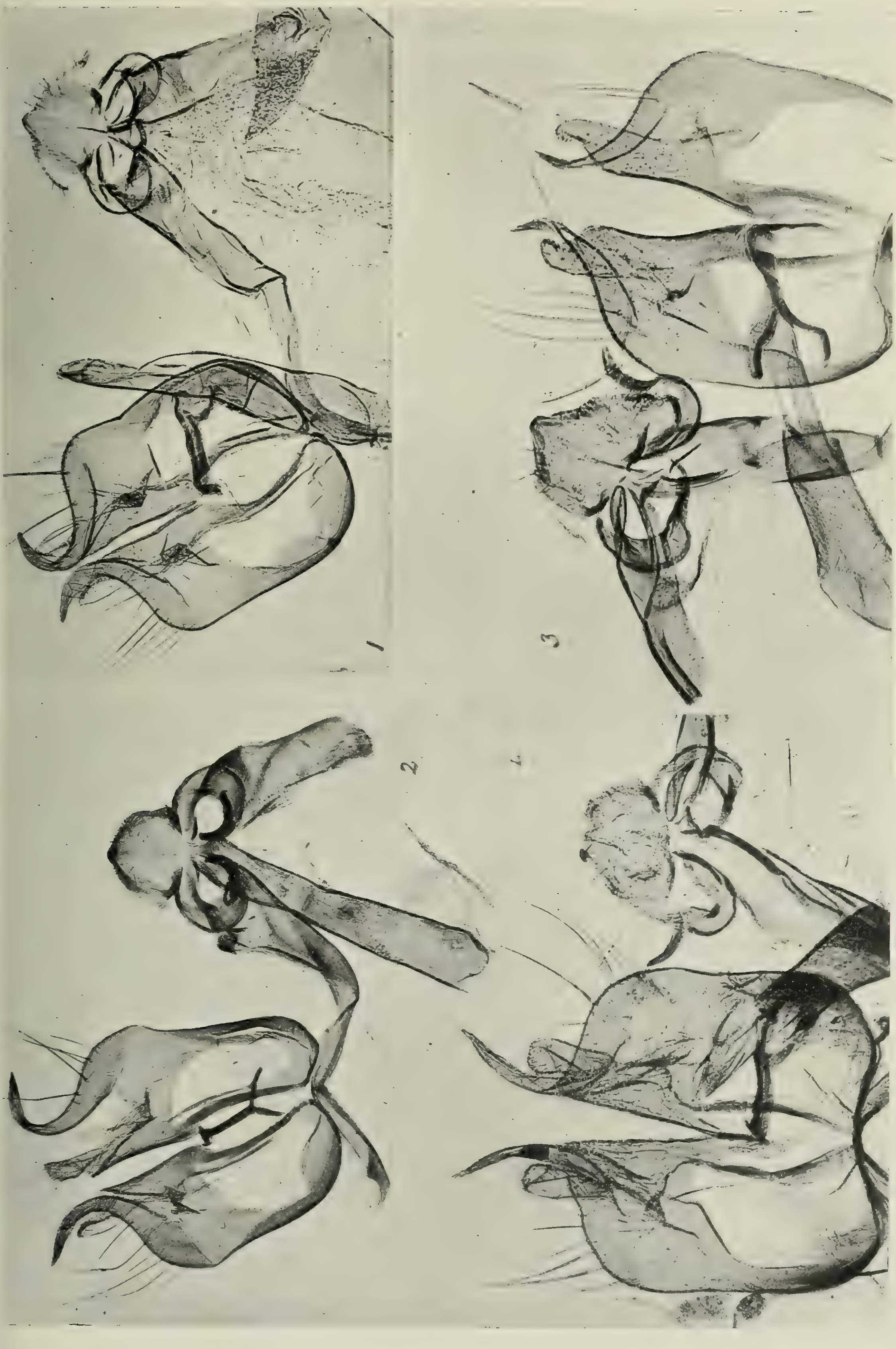
Based on the characters of the genitalia, supported by the spotting of the underside, it would appear that *argiades*, Pall., and *alcetas*, Hoffmansegg, are distinct species (*Ent. Rec.*, xx., pp. 231 *et seq.*). Chapman says that, on genitalic characters, Nearctic specimens, assumed to be *amyntula*, from the Pacific slopes, combine the characters of these two forms, whilst Bethune-Baker considers *comyntas* from the Central States to agree specifically with *argiades*, as judged by the same characters. Central American specimens, however, which usually pass under the name of *comyntas*, in common with those from the northern and eastern parts of North America, are said by Chapman to be, on the showing of the genitalia, quite distinct from the specimens of the Pacific slopes, referred to *amyntula*. One suspects, therefore, that a mixture of species is passing at present in North America under the name *comyntas*. Chapman further differentiates the Himalayan *dipora*, Moore, from *argiades*, Pall., and finds *parrhasius*, Fab. (the name being applied to the dark species so abundant in the Oriental region of south-east Asia and Australia), quite distinct from typical *argiades*, in contradiction to de Nicéville's conclusion that they are all one species, a conclusion followed by Elwes, Bingham, and other recent authors. The geographical limitations of *argiades*, *dipora*, and *parrhasius* in India and the south-eastern parts of Asia can only be roughly defined. There appears to be no reasonable doubt that the Japanese and Chinese insects—*praxiteles*, Feld., and *hellotia*, Mén.—are forms of *argiades*, Pall., but further examination even here is desirable. The very different genitalic characters existing between *parrhasius*, Fab., and *argiades*, Pall., in spite of their superficial resemblance, compared with the comparatively slight differences existing between *argiades*, Pall., and *minimus*, Fuessly, are noteworthy, and suggest a wider separation between *argiades* and *parrhasius* than one would otherwise be willing to allow, and it is probable that this close superficial resemblance is parallel with that presented by other small blues, *e.g.*, *Cyaniris semiargus* and *Cupido sebrus*, which, in spite of their similarity of appearance, belong to two entirely different Lycænid tribes. Chapman observes that it may be noted that *argiades* and *parrhasius* show considerable difference in texture, etc., in which detail *Cupido minimus* agrees with *Everes argiades*. It will be readily understood from what we have already stated that our actual knowledge of the Everid species, even those that have been described very many years, is exceedingly defective.

The distribution of the genus is Holarctic, surrounding the globe in the Palæarctic and Nearctic regions, and entering the Oriental region in India, Malay, etc. Its northern limit is not great, apparently, in the Old World, little above 55-60° N. lat., whilst its southern limit, according to Scudder, in the Nearctic region reaches 12° N. lat., and whilst it covers Europe, extends in Asia well down towards the equator, although, as noted above, the southern limit of *E. dipora*, the most southern species of our limited genus, can only be roughly defined, but extends at any rate well below 20° N. lat.

EVERES ARGIADES, Pallas.

SYNONYMY.—Species: **Argiades**, Pallas, "Reisen," etc., p. 472 (1771); Fab., "Mant. Ins.," ii., p. 76 (1787); Bork., "Sys. Besch.," ii., p. 232 (1789); Fab., "Ent. Sys.," iii., pt. 1, p. 300 (1793); Ill., "Schmett. Wien.," 2nd ed., p. 62 (1801); Oken, "Lehrb.," ii., p. 720 (1815); Butl., "Cat. Diurn. Lep.," p. 169

PLATE III.

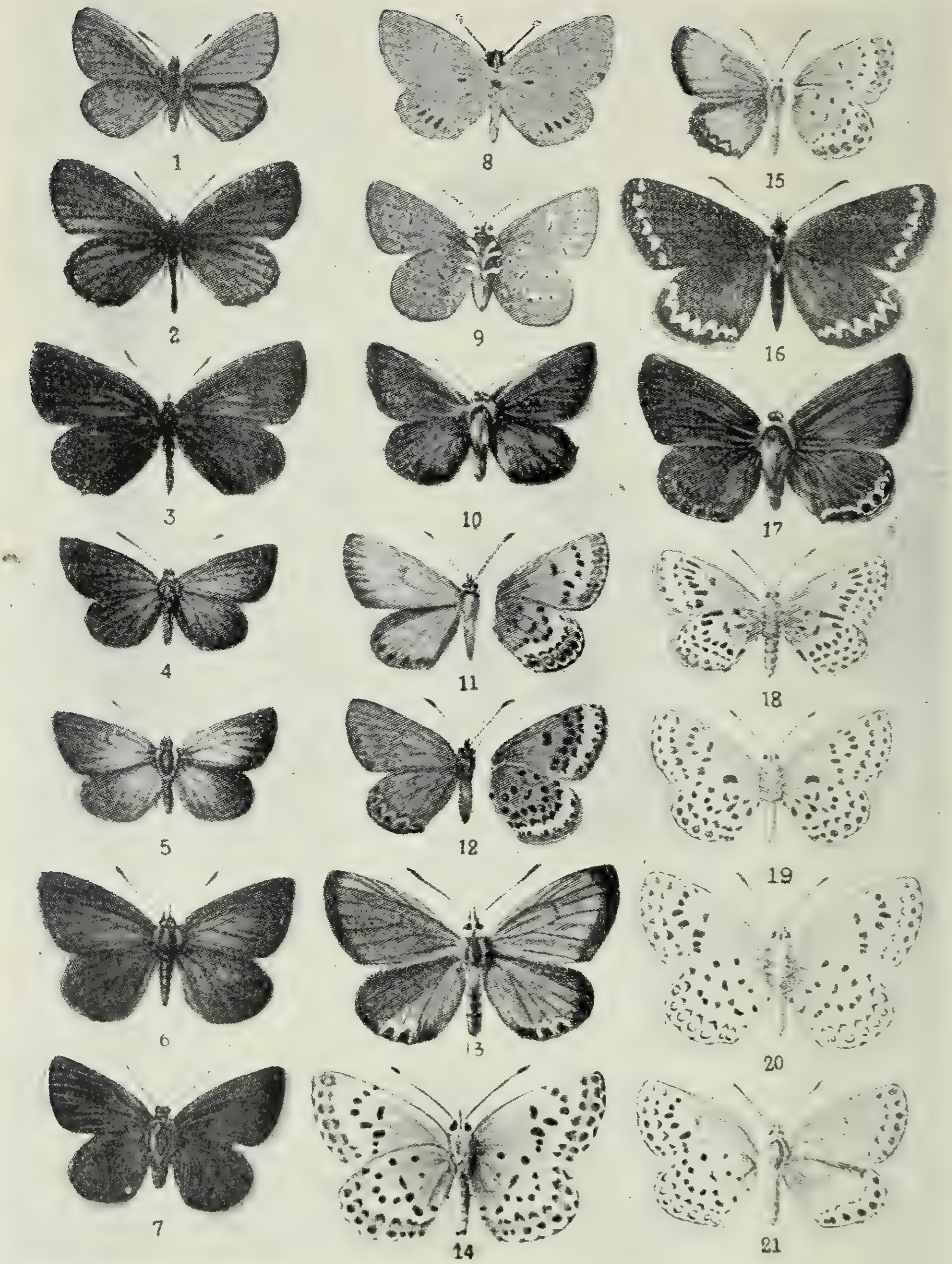


A Natural History of the British Butterflies, etc., 1909. *Photo. F. N. Clark.*

MPARATIVE VIEW OF THE ANCILLARY APPENDAGES OF (1) EVERES ARGIADES, (2)EVERES VAR. DIPORIDES, (3) EVERES VAR. AMYNTULA, (4) EVERES ALCETAS (ALL × 45.)

(To face p. 50.)

Plate IV.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Lycænids.—Everes argiades (1-3). Cupido minimus (4-9). Plebeius argus (10-21).

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 51.]

Explanation of Plate IV.

Fig. 1. Everes argiades ♂ var. gen. 1 *polysperchon.*
,, 2. Everes argiades ♂ ab. *purpurascens.*
,, 3. Everes argiades ♀ ab. *nigrescens.*
,, 4. Cupido minimus ♂ ab. *violascens.*
,, 5. Cupido minimus ♂ ab. *caerulescens.*
,, 6. Cupido minimus ♂ ab. *major.*
,, 7. ,, ,, ♀ ab. *major.*
,, 8. ,, ,, ab. *striata.*
,, 9. ,, ,, ab. *pseudolus.*
,, 10. Plebeius argus ♂ (heath form).
,, 11. Plebeius argus ♂ var. *cretaceus.*
Fig. 12. Plebeius argus ♀ var. *cretaceus.*
,, 13. Plebeius argus ♂ var. *casaicus* ab. *lilacina-rufolunulata.*
,, 14. Plebeius argus ♂ var. *casaicus* ab. *lilacina-rufolunulata* (underside).
,, 15 Plebeius argus ♂ var. *philonomus* ab. *rufolunulata.*
,, 16. Plebeius argus ♀ var. *casaicus* ab. *virgata.*
,, 17. Plebeius argus ♀ ab. *posteroflavus.*
,, 18. Plebeius argus ♀ ab. *radiata.*
,, 19. Plebeius argus ♀ ab. *costajuncta.*
,, 20. Plebeius argus ♂ trans. ab. *linea.*
,, 21. Plebeius argus ♀ ab. *croceocaerulescens.*

[To face plate IV.]

(1869); Kirby, "Syn. Cat.," p. 356 (1871); Staud., "Cat.," 2nd ed., p. 9 (1871); Curò, "Bull. Soc. Ent. Ital.," vi., p. 109 (1874); Scudd., "Hist. Sketch," p. 149 (1875); Rössl., "Lep. Wiesb.," p. 29 (1881); Elwes, "Proc. Zool. Soc. Lond.," p. 887 (1881); Kirby, "Eur. Butts.," p. 53, pl. xiv., fig. 11 (1882); Lang, "Butts. Europe," i., p. 101, pl. xxii., fig. 5 (1884); Kane, "Eur. Butts.," p. 35 (1885); Camb., "Entom.," xviii., pp. 249-252 (1885); Leech, "Proc. Zool. Soc. Lond.," p. 415 (1887); Auriv., "Nord. Fjär.," p. 15, pl. vi., fig. 1 (1888-1891); Pryer, "Rhop. Nihon.," p. 17, pl. iv., figs. 23*a*-*b* (1888); Dale, "Brit. Butts.," p. 53 (1890); de Nicév., "Butts. India," iii., p. 137, *in part*, pl. xxvi., fig. 180 (1890); Barr., "Lep. Brit. Isl.," i., p. 68, pl. x., figs. 2-2*b* (1893); Leech, "Butts. China," ii., p. 328 (1894): Rühl, "Gross-Schmett.," pp. 228, 750 (1892-5); Meyr., "Handbook," etc., p. 345 (1895); Tutt, "Brit. Butts.," p. 185, pl. ii., fig. 5 (1896); "Ent. Record," vii., pp. 220, 300 (1896); Kirby, "Handbook," etc.. ii., p. 85, pl. xlv., figs. 4-6 (1896); Tutt, "Ent. Rec.," ix., p. 254 (1897); Reut., "Ent. Rec.," x., p. 97 (1898); Staud., "Cat.," 3rd ed., p. 77 (1901); Lamb., "Pap. Belg.," p. 219 (1902); Wheeler, "Butts. Switz.," p. 44 (1903); Tutt, "Ent. Rec.," xviii., p. 131 (1906); South, "Brit. Butts.," p. 156, pl. ciii., figs. 4-7 (1906); Bingham, "Faun. Ind.," ii., p. 377, *in part* (1907); Tutt, "Ent. Rec.," xx., pp. 79, 231 (1908). **Tiresias,** Rott., "Naturf.," vi., p. 23 (1775); Schiff., "Schmett. Wien.," 1st ed., p. 274 (1775); Esp., "Schmett. Eur.," i., pt. 1, p. 337 (1779); pl. xxxiv. (supp. x.), figs. 1-2 (1777); Bergs., "Nomen.," ii., p. 73, pl. xlv., figs. 1-4 (1779); iii., pp. 11, 34-35, pl. liv., figs. 3-4 (1779); Schneid., "Sys. Besch.," p. 260 (1787); Fab., "Mant. Ins.," ii., p. 70 (1787); Bork., "Sys. Besch.," i., pp. 166, 280 (1788); ii., p. 232 (1789); De Vill., "Car. Linn. Ent. Faun. Suec.," ii., p. 75 (1789); Brahm, "Ins. Kal.," p. 386 (1791); Scriba, "Journal," p. 221 (1791); Bkh., "Rhein. Mag.," p. 292 (1793); Hb., "Eur. Schmett.," pl. lxv., figs. 319-21 (1805); Herbst, "Nat. Sys. Ins.," xi., p. 77 (1804); "Ill. Mag.," iv., p. 66 (1804); Oken, "Lehrb.," ii., p. 720 (1815); Godt., "Enc. Méth.," ix., pp. 659-660 (1819); Bdv., "Eur. Lep. Ind.," p. 11 (1829); Dup., "Pap. Fr.," supp. i., pp. 337, 390 (1832); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); Dup., "Cat. Meth.," p. 31 (1844); Doubleday, "List Lep. Brit. Mus.," ii., p. 44 (1847); Heydrch., "Lep. Eur. Cat. Meth.," p. 15 (1851); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 490 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 19 (1852); Hein., "Schmett. Deutsch.," i., p. 85 (1859); Staud., "Cat.," 1st ed., p. 4 (1861); Kirby, "Man.," p. 99 (1862); Berce, "Faun. Fran.," p. 133 (1867); Snell., "De Vlind.," i., p. 61 (1867). **Amyntas,*** Schiff., "Schmett. Wien.," 1st ed., p. 274 (1775); Fab., "Spec. Ins.," ii., p. 133 (1781); Schneid., "Sys. Besch.," p. 260 (1785); Fab., "Mant. Ins.," ii., p. 70 (1787); Bkh., "Syst. Besch.," ii., p. 232 (1789); Fab., "Ent. Syst.," iii., pt. 1, p. 285 (1793); Bkh., "Rhein. Mag.," i., p. 292 (1793); Rossi, "Mant.," ii., p. 12 (1794); Hb., "Eur. Schmett.," pl. lxv., figs. 322-4 (1799); Ill., "Schmett. Wien.," 2nd ed., ii., p. 274 (1801); Hoffmansegg, "Ill. Mag.," iii., p. 185 (1803); Laspeyres, "Ill. Mag.," iv., p. 66 (1804); Herbst, "Nat. Sys. Ins.," xi., p. 73 (1804); Hb., "Eur. Schmett.," text p. 51 (1805); Ochs., "Die Schmett.," i., pt. 2, p. 59 (1808); Oken, "Lehrb.," ii., p. 720 (1815); Hb., "Verz.," p. 69 (1816-18); Ochs., "Die Schmett.," iv., p. 26 (1816); Latr., "Enc. Méth.," p. 607 (1819); Godt., "Pap. Fr.," i., p. 194, pl. ix., sec. fig. 2, ter. fig. 5 (1821); "Enc. Méth.," ix., p. 659 (1819); Bdv., "Eur. Lep. Ind.," p. 11 (1829); Meig., "Eur. Schmett.," ii., p. 13, pl. xliv., figs. 4*a*-*c* (1830); Dup., "Pap. Fr.," supp. i., pp. 387, 390 (1832); Treits., "Die Schmett.," x., supp. i., pp. 72, 237 (1834); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); H.-Sch., "Sys. Bearb.," i., p. 129 (1843); Evers., "Faun. Volg.-Ural.," p. 56 (1844); Dup., "Cat. Méth.," p. 31 (1844); Koll., "Hugel's Kaschmir," p. 421 (1844); Sél.-Long., "Mém. Soc. Sc. Liège," pt. ii., pp. 3, 31 (1845); West. and Hew., "Gen. Diurn. Lep.," ii., p. 490 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 19 (1852); Ménét., "Cat. Lep. Mus. Petr.,"

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* The *Papilio amyntas* of Poda (*Ins. Mus. Graec.*, p. 79) and Scopoli (*Ent. Carn.*, no. 457) have nothing to do with the present family. The latter author's *amyntas* has long been recognised as a synonym of *Cœnonympha arcania*, Linn., and Werneburg argues (*Beitr.*, i., p. 296), with great plausibility, that that of Poda is the same species, and his determination should, perhaps, be accepted, especially as Poda was certainly in touch with Scopoli; in any case his description shows it must be a near ally thereof. Nor is the *Papilio amyntas* of Fabricius (*Syst. Ent.*, 1775, p. 533) the present species, although that of the *Mant. Ins.*, p. 70, just as certainly is.

p. 55 (1855); Horsf. and Moore, "Cat. Lep. East Ind. Co.," i., p. 22, *in part* (1857); Speyer, "Geog. Verb. Schmett.," i., p. 250 (1858); Staud., "Cat.," 1st ed., p. 4 (1861); Butl., "Cat. Diurn. Lep.," p. 164 (1869); Frey, "Lep. Schweiz," p. 14 (1880). **Polysperchon,** Bergst., "Nom.," ii., p. 72, pl. xliv., figs. 3-5 (1779); Bkh., "Sys. Besch.," i., p. 166 (1788); Ochs., "Die Schmett.," i., pt. 2, p. 61 (1808); Oken, "Lehrb.," ii., p. 720 (1815); [Ochs., "Die Schmett.," iv., p. 26 (1816);] Hb., "Verz.," p. 69 (1816); Godt., "Enc. Méth.," ix., p. 660 (1819); [Bdv., "Eur. Lep. Ind.," p. 11 (1829);] [Meig., "Eur. Schmett.," ii., p. 15, pl. xliv., figs. 6*a*-*b* (1830);] Treits., "Die Schmett.," supp. x., pp. 72, 237 (1834); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); [H.-Sch., "Sys. Bearb.," i., p. 129 (1843);] Eversm., "Faun. Volg.-Ural., p. 57 (1844); Dup., "Cat. Méth.," p. 31 (1844); Doubleday, "List Lep. Brit. Mus.," ii., p. 44 (1847); Hdrch., "Lep. Eur. Cat. Meth.," p. 15 (1851); West. and Hew., "Gen. Diurn. Lep.," ii., p. 490 (1852); Led., "Verh. zool.-bot. Gesell.," ii,, p. 19 (1852); Ménét., "Cat. Lep. Mus. Pet.," p. 55 (1855); [Spyr., "Geog. Verb.," i., p. 250 (1858);] Hein., "Schmett. Deutsch.," i., p. 85 (1859); Staud., "Cat.," 1st ed., p. 4 (1861); Snell., "De Vlind.," i., p. 61 (1867); [Berce, "Faun. Franc.," i., p. 133 (1867);] Staud., "Cat.," 2nd ed., p. 9 (1871); Curò, "Bull Soc. Ent. It.," vi., p. 110 (1874); Frey, "Lep. Schweiz," p. 14 (1880); Kirby, "Eur. Butts.," p. 53 (1882); Lang, "Butts. Eur.," p. 102 (1884); Kane, "Eur. Butts.," p. 35 (1885); [Leech, "Butts. China," ii., p. 329 (1894);] Rühl, "Pal. Gross.-Schmett.," i., pp. 229, 750 (1892-5); Tutt, "Brit. Butts.," p. 185 (1896); Staud., "Cat.," 3rd ed., p. 77 (1901); [Lamb., "Pap. Belg.," p. 219 (1902);] Wheeler, "Butts. Switz.," p. 44, *in part* (1903); **Puer,**† Schrank, "Fauna Boica," ii., pt. 1, p. 215, *in part* (♂) (1801). [**Comyntas,**

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† The specific position of *puer* has long been a matter of controversy. Schrank's description (*Fauna Boica*, p. 215) reads as follows:—

Cupido puer.—*Papilio minimus*, Fuessly, "Schweiz," n. 599 = Göze, "Beytr.," iii., 2, p. 68, n. 52; Esper, "Europ. Schmett.," i., tab. 34, fig. 3. *Papilio tiresias*, "Syst. Beschr.," 260. *Papilio pseudolus*, Borkhausen, "Naturg.," i., 177. Schaeffer, "Icon.," 165, figs. 1, 2.

♂ Deep bright blue, small tailed; below light gray, small-eyed, with a few orange-coloured marginal spots. ♀ Blue-black, tailless; below small-eyed with traces of whitish marginal spots. Hab. near Gern and Ingolstadt in open places in forests. N.B.—Two varieties are known.

♂. *Var.* 1.—Forewings: Upperside deep bright blue with a narrow black border to the hind margin, and white fringes; the underside pale grey, with a fine median transverse streak; an arcuate row of six very small ocellated spots, the innermost of which is double; towards the edge a marginal row of obsolete ocellations, not distinct in the finest specimens. Hindwings: Upperside as in the forewings, except that there is a marginal row of small spots, which, at the 4th, fades into the margin itself; a very fine tail at the anal angle composed of fringe-hairs; the underside with a small indistinct discoidal line, followed by an arcuate line of four very small ocellated spots, one near the outer margin, two in the middle, somewhat near together, and one towards the inner margin; on the hindmargin are two small silvery-green ocellations, surrounded by orange-yellow and bordered with black. N.B.—Traces of a few more spots are noticeable under a lens, on the hindwings, *viz.*, two before the small discoidal lunule, one near the outer and another near the inner marginal spots.

♂. *Var.* 2.—Forewings: Upperside as in 1. The underside similar, except that the arcuated row consists of seven ocellated spots, and that the traces of the marginal eyes are much more distinct. Hindwings: Upperside as in 1, the underside also, except that there are two spots between the discoidal streak and the base; that the arcuate row consists of nine ocellated spots, two of these being at the outer two on the inner edge, four in the centre, and a very small double one between these and those of the inner edge; a third obsolete spot can be detected beyond the two marginal spots.

♀. *Var.* 1.—Forewings: Upperside black-blue; underside similar to ♂ var. 1, but without trace of marginal ocellations. Hindwings: Upperside black-blue; the underside as in ♂ var. 1, except that there are only whitish traces of marginal ocellations to be seen; there are, also, two very small ones, then a short transverse streak, hardly noticeable; then at its inner termination a very small ocellated spot; beyond these the arcuated series of eight ocellated spots—two at inner edge, two at outer edge, three in the centre in a somewhat oblique direction—also one at inner edge, and a double one above this.

God., "Enc. Méth.," ix., pp. 608, 660 (1819), etc. See also *Comyntas posteà*.] [**Amyntula,** Bdv., "Ann. Soc. Ent. Fr.," p. 294 (1852), etc. See also *Amyntula posteà*.] **Hellotia,** Mén., "Cat. Lep. Mus. Petr.," p. 84 (1856), etc. See also *Hellotia posteà*. **Praxiteles,** Feld., "Verh. zool.-bot. Gesell.," xii., p. 489 (1862); "Reis. Nov. Lep.," ii., p. 281, pl. xxxv., fig. 5 (1865). [**Dipora,** Moore, "Proc. Zool. Soc. Lond.," p. 506, *in part*, pl. xxxi., fig. 8 (1865); see *Diporides posteà*.] [**? Monica,** Reak., "Proc. Acad. Nat. Sci. Phil.," p. 244 (1866).] [**? Tijua,** Reak., "Proc. Acad. Nat. Sci. Phil.," p. 245 (1866).]

ORIGINAL DESCRIPTION.—*Papilio argiades* (*Pleb. Rur.*). *Papilioni argiolo* utraque pagina simillimus, sed dimidio minor, alisque subcaudatis (ut *Papilio rubi*) et angulo ani fulvo diversus. Femina (ut in *Papilione argo*) fusca. Habitat in *Holco odorato* (Pallas, *Reisen*, i., p. 472).

IMAGO.—24mm.-30mm. ♂ Violet- or purple-blue; the forewings with a narrow blackish marginal border; the hindwings with a marginal series of interneural black dots, sometimes lost in the margin like that of the forewings, with a delicate black tail, covered with long white scales, near the anal angle; fringes grey internally, white externally. ♀ fuscous, sometimes tinted at the base with violet- or purplish-blue, sometimes with these tints extending over the disc of the forewings, and from the base to the outer margin in the hindwings, usually two orange crescents just above the tail, with darker centres, the orange again sometimes edged with blue. [For underside see *posteà*.]

SEXUAL DIMORPHISM.—The sexes are markedly different in colour, the ♂ being blue, the ♀ blackish-brown, some entirely so, others much sprinkled with blue scales to the outer margin, with all intermediate stages, and usually with one or two orange or yellow spots on the hind-margin of the hindwings (for details see *posteà* pp. 54-55). The scaling is described in detail by Pierce (*in litt.*) as follows: ♂ (1) The transparent scales are yellow ·0035 in. × ·0013 in., largely 3-lobed, the lobes very even. (2) The dark scales are 3-lobed, but more acutely-pointed. (3) The androconia are ·001 in. × ·001 in., almost round, with 14 rows, each composed of 12 or 13 spots, which are very distinct but connected by a very fine line. (4) The underside scales are 4-pointed. ♀ (1) No transparent scales. (2) Dark scales 4-pointed. (3) The under scales also 4-pointed.

VARIATION.—The variation of this species is as interesting as it is puzzling; interesting in the racial peculiarities it presents in various parts of its wide range, puzzling in the difficulties of determining whether some of the characters presented are sufficiently developed or defined to be considered of specific value or not. The differentiation of the Oriental *parrhasius*, Fab., referred by de Nicéville to this species, is markedly sufficient to separate it not only specifically but generically, and this conclusion is borne out by the ancillary appendages of the genitalia, which suggest a farther removal from typical *argiades* than is shown by the apparently much more distant *minimus* in this particular character. We may further grant that *alcetas*, Hoffmansegg (generally known as *coretas*, Ochs.), is also specifically distinct (see *Ent. Rec.*, xx., pp. 79 *et seq.*, pp. 231 *et seq.*). Apart, however, from these some doubt may still exist as to the Himalayan, Thibetan, and Eastern Chinese examples referred to

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♀. *Var.* 2.– Similar to ♀ var. 1, but no spot on the transverse streak, and nine in the arcuated series as in ♂ var. 2.

this species, although there can, perhaps, be none in the case of the Japanese and none in the Central Asiatic examples. There appears to be more than one American species included under the name *comyntas* by different authors, and, besides this, the specific characters of the American insects usually referred to *amyntula*, *monica*, etc., are very unsatisfactorily determined, the number of species and their distinctness from the Palæarctic *argiades* (or *alcetas*) being alike unproven. In our Palæarctic examples of *E. argiades* the most striking developments are in the direction of (1) difference in the tint of the upperside in both sexes, (2) the proportion of the various colours on the upperside in the ♀, (3) the tint of the underside, (4) the character and direction of the spots on the underside, (5) the quantity of fulvous on the upper- and underside, (6) the absence of metallic kernels in the fulvous spots on the underside, (7) the presence or length of the caudal appendages, and (8) difference in size. The ground colour of the upperside ♂ is typically blue, of the ♀ fuscous, inclining to blackish, with marginal orange crescents, largest just above the tail of the hindwing. The ♂s in the British Museum coll. show the following variation in ground colour:—

1. Pale blue-grey = ab. *ardescens*, n. ab.
2. Violet-blue = *argiades*, Pall.
3. Purplish-blue = *purpurascens*, n. ab.

The broader marginal border is sometimes conspicuous in all the forms, and one gets aberrations, *ardescens-marginata*, *typica-marginata*, and *purpurascens-marginata*. There is generally some trace of black marginal spots on the hindwings, and Zeller notes a *marginata* form of a more intense blue with an admixture of reddish colour (*Stett. Ent. Ztg.*, 1849, x., p. 181). The ♀s show considerable variation in the ground colour, in the character of the marginal spots, in the amount of blue scaling, and the quantity of fulvous. The most striking forms of the upperside of the ♀ that we have so far noted may be grouped as—

1. Blue, almost as in the ♂, forewings with dark margin, hindwings with the row of marginal dots surrounded by pale blue crescents = ab. *bergsträsseri*, n. ab. (*polysperchon*, Bergs., "Nom., pl. xliv., fig. 5).

1*a*. As in 1, but with brown (orange) crescents round marginal dots of hindwings = ab. *jodina*, Aigner-Abafi.

2. Pale fuscous, the forewings pale grey-blue to beyond disc; the hindwings mostly pale grey-blue, especially developed in the usual position of the crescent-marks, round the marginal spots = ab. *ardescens*, n. ab.

2*a*. As in 2, with orange crescents more or less developed round marginal spots of hindwings = ab. *ardescens-fulva*, n. ab.

2*b*. As in 2, but the pale grey-blue confined to the base of wings without orange lunules = ab. *ardescens-restricta*, n. ab.

2*c*. As in 2*b*, but with orange crescents = ab. *ardescens-completa*, n. ab.

2*d*. Pale fuscous, without blue shading, but with orange crescents = ab. *pallida-fulva*, n. ab.

2*e*, Pale fuscous, without blue shading or orange crescents = ab. *pallida*, n. ab.

3. Fuscous, forewings with bright blue scaling to beyond disc, and on hindwings to outer margin, strongly developed round marginal spots, so that, in the best-marked specimens, there is almost the appearance of a pale blue band parallel with the dark outer margin = ab. *caerulescens*, n. ab.

3*a*. As in 3, but with orange crescents round marginal spots of hindwings = ab. *caerulescens-fulva*, n. ab.

3*b*. As in 3, but the blue scaling confined to the base of the wings = ab. *caerulescens-restricta*, n. ab.

3c. As in 3b, but with orange crescents = ab. *caerulescens-completa*, n. ab.

3d. Fuscous, without blue shading, but with orange crescents = ab. *fusca-fulva*, n. ab.

3e. Fuscous, without blue shading or orange crescents = ab. *fusca*, n. ab.

4. Fuscous-black, forewings with blue scaling to beyond disc, and on hindwings to outer margin, strongly developed round marginal spots = ab. *extrema*, n. ab.

4a. As in 4, but with orange crescents round marginal spots of hindwings = ab. *extrema-fulva*, n. ab.

4b. As in 4, but the blue scaling confined to the base of the wings = ab. *extrema-restricta*, n. ab.

4c. As in 4b, but with orange crescents = ab. *extrema-completa*, n. ab.

4d. Fuscous-black, without blue shading, but with orange crescents = ab. *fulva-nigrescens*, n. ab.

4e. Fuscous-black, without blue shading or orange crescents = ab. *nigrescens*, n. ab.

The peculiar blue-grey tint, observable in some examples (ab. *ardescens*) of both sexes, and reminding one somewhat of the colour of *donzelii*, is exhibited in the British Museum coll., by the following: (1) a ♂ of full size, labelled "Frey coll., Bremgarten," also a ♀ slightly tinted at base, similarly labelled. (There are other "Bremgarten" examples quite typical in colour.) (2) Three ♂ s and two ♀ s under ordinary size, labelled "Frey coll., Zürich." (3) Three ♂ s and one ♀, small, evidently Zeller's *polysperchon* (*Stett. Ent. Ztg.*, 1849, p. 181). (4) One ♂, similar, but of fair size, labelled "*polysperchon*, *S.E.Z.*, '47, p. 181," with orange crescents, as in ♀, round the two black spots nearest tail.† (5) One ♂, labelled "Hökindf, May 29th, 1855." (6) One ♂ full size, simply labelled "Zell. coll." (7) One ♂, somewhat undersized, labelled "Zell. coll. ex. larv. April 26th, 1848." (8) One ♀, average size, labelled "Hakodate, June or July, '87, Leech coll." It may be further noted that nos. 4 and 6 (*suprà*) are exceptionally pallid, almost whitish (= ab. *pallescens*, n. ab.), also that two examples of *comyntas* labelled "Zell. coll. Dallas. Texas (Boll)" are very similar to no. 4. Further, that a rather pale blue example, approaching, but yet a great way off, the normal fulness of colour, is labelled by Zeller "*polysperchon* var., *Stett. Ent. Ztg.*, '47, 181, Glogau." It would appear that the Glogau examples, bred by Zeller, and whose life-histories are described by him at length (in 1849 not 1847 as per label) under the name *polysperchon*, are mostly of the unusual colour-form here noted as *ardescens*. The range of ♀ variation is great. Reverdin notes that "the Swiss ♀ s of *argiades* are brown, with the exception of one ♀ taken at Hérémance (July 18th, 1901), which is strongly powdered with blue at the base of the forewings, as are also the whole of the hindwings—almost to the margin, except an anterior band, 3mm. wide, very sharply cut off behind, which remains brown; three black antemarginal dots (in cells 2, 3 and 4) stand out conspicuously in the blue; of the others two have fulvous lunules on the upperside of the hindwings, one has one only, at the level of the tail, and the other has another beyond this, two in all." The discoidal lunule on the upperside of the forewings varies greatly in both sexes, being sometimes very strongly developed, at other times quite absent. It is noted as developed in *amyntas*, Fabr. The ground colour of the underside varies from white to grey, occasionally with the bluish-white tint, so characteristic of *Celastrina argiolus.* The spotting is very characteristic, especially on the forewings, being somewhat elongated, in the form of little streaks, and very analogous to that of *Celastrina argiolus*, and the spots are usually seven in number. They are sometimes rather more rounded, and then appear to approach the form one recognises as characteristic of *E. alcetas.* Their continuity, too, is usually most marked, but here again they sometimes take on the form of an angulated line, curving in a way that again suggests the normal condition in *E. alcetas.* The uniformity of spotting on the underside of the forewings is well-illustrated by Reverdin (*Ent. Rec.*, xx., p. 264), whilst, at the same time, considerable difference in the spotting of the underside of the hindwings is recorded. The comparison between the spotting of the undersides of *E. argiades* and *E. alcetas* (*op. cit.*) are also full of interest. It may be here noted that Esper gives [*Schmett. Eur.*, pl. xxxiv. (supp x.), fig. 2] a ♂, called *tiresias* (but without the characteristic metallic kernels on the underside of this form), with a straight and very typical row of spots, whilst his fig. 1 is a ♀, with an angulated row; both present the characteristic fulvous crescents of *E. argiades.* There is much difference also in the intensity of the spotting in the transverse row; in some only traces of the white margins are left, the black dashes being absent = ab. *caeca*, Aigner-Abafi, in others the transverse row of spots is entirely obsolete = ab. *depuncta*, Hirschke, in some the dashes are few and small = ab. *parvipuncta*, n. ab., whilst in others they are larger and much more marked than in the usual typical form = ab. *magnipuncta*, n. ab., whilst Blachier notes (*in litt.*) a specimen with the transverse row of spots developed into streaks = ab. *striata*, n. ab. The main character, however, is the variability of the orange or fulvous crescents. The usual form shows two moderately developed, and one ill-developed crescent. In others these are more or less beautifully-kernelled with metallic scales = *tiresias*, Rott.; in yet others the orange is most strikingly deep in tint, and continued as a submarginal band for some distance = ab. *rufescens*, n. ab., whilst others on the contrary are pallid, weak, and faint yellow = ab. *flavescens*, n. ab. Of nine Swiss ♀s Reverdin notes (*in litt.*): "Beneath, the hindwings of *argiades*, L., vary as to the yellow spots; four examples have two (in cells two and three), four have three (in cells two, three and four), the third the smallest, and one has only one (in cell two), with a slight indication of the second." Bingham says (*Fauna India*, ii., p. 379) that "specimens from very dry localities in Upper Burma, and from Great Nicobar Island, are remarkably small and pale, with the markings on the upperside, especially the subtornal ochraceous-yellow patch, more or less obsolescent. [Remarks relating to all oriental forms of *argiades* must be accepted with caution as to whether or not they really belong to this species. The Upper Burma examples here noted may belong to *argiades*, the Great Nicobar examples almost certainly do not.] In size, there are three more or less marked forms (1) = ab. *minor*, n. ab., less than 24mm. usually found in the spring and autumnal broods, (2) ab. *intermedia*, n. ab., less than 28mm., usually found in all broods, being the larger of the spring and autumn, and the smaller of the summer broods, (3) ab. *major*, n. ab., exceeding 28mm., and comprising the largest of the summer brood, but the forms overlap most noticeably. Reverdin gives maximum and minimum measurements of examples of both sexes of this in his collection (*Ent. Rec.*, xx., p. 265). The Denmark examples in the British Museum collection, ♂ s and ♀ s, are exceptionally large, as also are specimens from "Bagovitza, July 1893," but the largest examples of all, perhaps, are from the Changhai Mountains, Mongolia, and certain localities in Japan—Nagahama, Nagasaki, Satsuma, Kisogawa, and Sunagawa. The ♀ s of the summer brood, which we captured at Chavoire, near Annecy, July 31st-August 3rd, 1902, are very like the examples from the Changhai Mountains, both in their large size, dark colour,* and brighter orange crescents; they are also very similar in their general appearance to the example figured by Bergsträsser as *tiresias* (*Nomen.*, ii., pl. xlv., figs. 1-4). As to the variation in the length of the caudal appendage, one has to be cautious in coming to any conclusion, for it is a most delicate structure formed of the finest cilia, and often missing in the finest specimens, also sometimes missing on one side and present on the other. It is usually stated that *alcetas* has a shorter tail than *argiades*, and this appears to be certainly the case. The remarkably different forms to which various scientific authors have applied the names of the various races, compels us to give a brief summary of the best known of these. Taking the earliest descriptions of the best-known forms, we may summarise them as follows :—

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† Can this be the example mentioned above, noted by Zeller as of a "more intense blue with an admixture of reddish colour?"

Argiades, Pall. (1775).— ♂ blue like *C. argiolus*, but much smaller; the hindwings slightly tailed, and with fulvous crescents beneath. ♀ fuscous (as in ♀ *P. argus*).

Amyntas, Schiff. (1775), Fab. (1787).—Blue, with dark margin and white cilia; forewings with black discoidal lunule, hindwings tailed. Beneath ashy; spots somewhat obsolete; above and below, two black-centred fulvous crescents near anal angle (Fabricius).

Tiresias, Rott. (1776).— ♂ blue. ♀ dark brown (sometimes tinged with blue towards base); generally two orange-coloured marginal spots on hindwings; orange-coloured spots on underside of hindwings with green metallic kernels.

Polysperchon, Bergs. (1779).— ♂ small, blue. ♀ blue-tinted on black; hindwings with marginal spots surrounded by blue crescents; underside with orange crescents.

Esper, in 1777, under the name of *tiresias*, figured (*Eur. Schmett.*, pl. xxxiv. [supp. x.], figs. 1-2) a ♂ (fig. 2), and ♀ (fig. 1), neither with any trace of the characteristic metallic kernels of this form, in the orange crescents above the tail. He also figured (pl. xlix. [supp. xxv.], fig. 2) another ♀, under this name, blue-black, without any orange crescents above or beneath,† and so, of course, without the characteristic, metallic kernels of true *tiresias*. In 1779, Bergsträsser described and figured *tiresias* twice (*Nom.*, ii., p. 73, pl. xlv., figs., 1-4; and iii., p. 11, pl. liv., figs. 3-4). He refers the name to Esper, and evidently followed this author. He gives (pl. xlv., figs. 1-4) very good figures of the large form that we have taken at Chavoire; the ♀ is particularly like these examples, but none of them have the metallic kernels on the underside of the hindwings that characterise *tiresias*. Bergsträsser himself discovered this, and gives (*Nom.*, iii., pp. 34-5) Viber's* account of *tiresias* in which he notes that "the underside in both sexes is quite whitish . . . . whilst on the hindwings are two orange-coloured spots, as on the upperside, but they have here two small, shiny, green eyes." Schneider, in 1785, also described a *tiresias* (*Sys. Besch.*, p. 260), of which he notes that "at the middle of the margin of the hindwings on the underside, are two orange spots, margined on their inner edge with black, and toward their outer edge kernelled with a similarly-coloured point," but he also does not mention the metallic nature of these points. Hübner, in 1799, figures *alcetas* (*coretas*) under the name of *tiresias* (*Schmett. Eur.*, pl. lxv., figs. 319-21), whilst, on the same plate, figs. 322-4, he figures typical *argiades* under the name of *amyntas*. Ernst and Engramelle, in 1779, described and figured (*Pap. d'Europe*, i., p. 167, pl. xxxvii., figs. 78*a-d*) this species, without name, calling, however, the ♀ the ♂, and the ♂ the ♀; particularly noting the small size, the golden crescents on the upper- and underside of the hindwings in the ♀ and on the underside only in the ♂, as well as the marginal spots on the upperside of the hindwings in the ♂. They also figure and describe (*op. cit.*, figs. 79*a-b*) much smaller forms of the same insect, which they suppose represent the late brood, and refer the forms to *tiresias*, Esp., pl. xxxiv. (supp. x.), figs. 1-2, and pl. xlix. (supp. xxv.), fig. 2, respectively. The next year (*op. cit.*, ii., supp. p. 308, figs. 79*a-c*, bis) they described and figured an "intermediate" form under the name of "Le Myrmidon," the underside being the same, but the upperside very different, the ♂ (fig. 79*a*, bis) being entirely blue, but less deep than fig. 78*c*, although both have three black marginal dots on the hindwings; the ♀ (fig. 79*c*, bis) is black, the forewings tinged with blue at the base, and the hindwings bordered with spots of the same colour, etc. They then refer this to Bergsträsser's *polysperchon* (*Nom.*, p. 72, pl. xliv., figs. 3-5), and say that they copied the insect from Gerning's collection.† In 1845, De Sélys-Longchamps (*Mém. Soc. Roy. Sci. Liège*, ii., pt. i., p. 31) criticises the applications of the various names to different forms of the insect by different authors, and tabulates four forms, which he notes as follows:—

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* Oberthür particularly notes (*in litt.*) the blackness of the Thibetan ♀ s, and the contrasting large orange-yellow lunules on the upperside of the hindwings. This form would possibly be similar to the Mongolian, just noticed.

† This is evidently a small form of *alcetas*, Hffmg., and probably the form called *polysperchon* by some of the French lepidopterists, and certainly that taken in the Rhone Valley in Switzerland, by Favre, and others (Wheeler).

1. *Amyntas.*—Of large size, 13-14 lin. in expanse, with fulvous anal lunules, large beneath, reappearing above in the ♀; the latter, in Belgium, powdered with blue above, as are most ♀s of *alexis* (But Duponchel, Guenée, and De Villers have only seen brown ♀s in France. This form would be a variety). Godart's first description agrees exactly with Belgian specimens.

2. *Polysperchon* (*tiresias*, Hb.).—Of small size, without the yellow lunules at the anal angle. [To this I should like to refer a brown ♀ from Piedmont. But Duponchel says positively that it is always dusted with blue. This would be a variety.] Donckier has a ♂ from near Bordeaux without a black point near the anal angle above.

3. *Myrmidon.*—Of small size; the yellow lunules small below and appearing little or not at all above in the ♀, which is powdered with blue, offering often a bluish-spotted border on the hindwings. I refer here some ♂s received from

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* Attention may here be called to the identity of Von Rottemberg's original description of *tiresias*, and this referred by Bergsträsser to Viber. Is there any connection between Viber and Von Rottemberg?

† Bergsträsser's figures were also taken from Gerning's collection; the ♂ upperside of Ernst and Engramelle is practically identical with Bergsträsser's, the ♀, on the other hand, corresponds with his description but not with his figure.

Germany under the erroneous name of *polysperchon*, and two examples taken at Namur and Huy by Pôlet de Faveaux, on the limestone rocks in May and June, whilst *amyntas* appears at the end of July and August. *Myrmidon* only measures 9 lin. in expanse.

4. *Coretas.*—The fulvous anal lunule very small, the ocellated spots on the underside small, and almost without the little tail. If this last character be not accidental it would suggest a specific difference.

This summary involves some remarkable conclusions, and not a few contradictions (1) *Amyntas*, after de Sélys, would be our large form of typically coloured *argiades*, and with blue bases and well-developed fulvous crescents in the ♀; whilst the reference to the French authors would suggest ♀ *alcetas*. (2) The figures of *tiresias*, Hb., which de Sélys refers to his *polysperchon*, were named *alcetas* by Hoffmansegg, and were so called by Hübner (*Eur. Schmett.*, text p. 51); later, Hübner (*Verz.*, p. 69) erroneously referred this insect to *polysperchon*, Bergstr., with which it has nothing whatever in common; de Sélys follows this error, and could not possibly have consulted the original figures or descriptions.* (3) *Myrmidon*, of Ernst and Engramelle, appears to be a mere duplication of *polysperchon*, Bergs., to which these authors referred their insect; the blue ♀s, therefore, received by de Sélys from Germany, would possibly be quite correctly named; de Sélys' *myrmidon* also agrees in its small size. (4) *Coretas*, as described by de Sélys, would appear to be true *alcetas*. De Sélys' attempt to put these various forms right, therefore, was not very successful, as he failed to refer to the original descriptions. When Zeller, in 1847-8, first proved conclusively that the smaller spring race, then generally known in Germany as *polysperchon*, was the progeny of the larger summer race, then called *amyntas*, by breeding one from the other, he reared some remarkably pale-grey or greyish-blue forms that are now in the Brit. Mus. coll., and have already been noted (*anteà* pp. 54, 55). Two specimens he particularly describes (*Stett. Ent. Ztg.*, 1849, x., p. 181) as noteworthy: (1) ♂ of normal size; upperside more intense blue with admixture of reddish colour; the black borders are decided and broader than usual; the underside dark grey, much less whitish; whilst on the hindwings, the marginal spots, except the orange-coloured ones, are quite obsolete; the central row also is absent; only the ocellated spots on the outer and inner margin are there, and these are unusually small = ab. *semiobsoleta*, n. ab. (2) ♀, so abnormally coloured compared with the other ♀s that it was at first considered to be a ♂; the upperside bright blue, inclining to whitish on the costa and hind margin of forewings; the discoidal streak very distinct; the hindwing broadly blackened on the costa, has the marginal markings of the ♂ fully developed, the two red spots large and more brightly-coloured; the underside not at all abnormal. Schawerda records (*Verh. z.-b. Ges. Wien.*, liv., p. 123) a ♂ of *E. argiades*, with black hindwings, taken in the Hohen-Wand at about 1000m. Oberthür notes (*in litt.*) a particularly large ♂ taken at Entrevaux, in July, 1906, with a very wide black marginal border; he adds, that, strangely, in the not very distant locality of Digne, in July, 1904, the specimens were very small.

As to the seasonal dimorphism exhibited, apart from a general overlapping in the various broods in size, there is, certainly, on the whole, a distinct difference in the spring, summer, and autumnal forms, of which the spring and autumnal forms approach more nearly in size, and the summer and autumnal forms in appearance. The specimens of the spring brood are, on the whole, in both sexes, smaller, and the females more dusted with blue, whilst those of the summer brood are larger, and the females darker and much less dusted with blue of a somewhat darker tint; the specimens of the autumnal brood vary greatly in size from that of the smaller vernal examples to that of the larger æstival, though the colouring agrees with the latter. Oberthür states (*in litt.*) ; "In the spring, near Rennes, the ♀ generally has a pale blue tint overlying the black ground colour of the wings; of nine spring ♀ s seven have the forewings strongly blue, one has the hindwings blue, and one is almost entirely black, but shows a trace of the normal yellow lunules on the upperside of the hindwings; whilst all nine examples have two or three yellow spots on the underside of the latter; in summer, the ♀ s from the same district are large, black above, with yellow spots on the hindwings." The spring examples have usually been lumped together under the name *polysperchon*, Bergstr., but the ♀ of this latter insect, as figured by Bergsträsser, is a very extreme and comparatively rare aberration, in which all the wings are of a blue ground colour like the ♂ (see *infrà*). But Bergsträsser's description of the female *polysperchon* (*Nomen.*, ii., p. 72), "blue-tinted on black," is hardly consonant with the extreme ♀ form he figures (pl. xliv., fig. 4), and agrees much better with the less extreme ♀ s of the vernal brood, although his further description "the marginal spots of the hindwings encircled with blue," denotes a strong character in the figured example. It appears to us, therefore, advisable to retain the name, as have most other lepidopterists, for the more normal specimens of the spring form, and to name the extreme aberration figured ab. *bergsträsseri*. We may now add the details of the described forms that have come under our notice.

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* *Alcetas* is common in the Bordeaux district. Does *argiades* occur there?

European forms of Everes argiades.

α. var. **polysperchon,** Bergs., "Nom.," ii., p. 72, pl. xliv., figs. 3-5 (1779); Ochs., "Die Schmett.," i., pt. 2, p. 62 (1808); Oken, "Lehrb.," ii., p. 720 (1815); Ernst and Engr., "Pap. Eur.," i., p. 167, pl. xxxvii., figs. 79 *a*, *b* (1779); ii., p. 308, pl. lxxxiii. (ii. e supp. iv.), figs. 79 *bis a-d* (1780); Hb., "Verz.," p. 69, *in part* (1816-1818); Godt., "Enc. Méth.," ix., p. 660 (1823); Bdv., "Eur. Lep. Ind.," p. 11, *in part* (1829); Koll., "Verz.," p. 9 (1832); Treits., "Die Schmett.," x. (supp. i.), pp. 72, 237 (1834); Eversm., "Fauna Volg.-Ural.," p. 57 (1844); Dup., "Cat. Méth.," p. 31 (1845); Zell., "Stett. Ent. Ztg.," x., pp. 177-182 (1849); Heydrch., "Lep. Eur. Cat. Meth.," p. 15 (1851); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 490 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 19 (1852); Ménét., "Cat. Lep. Mus. Pet.," p. 55 (1855); Hein., "Schmett. Deutsch.," i., p 85 (1859); Staud., "Cat.," 1st ed., p. 4 (1861); Snell., "De Vlind.," i., p. 61 (1867); Staud., "Cat.," 2nd ed., p. 9, *in part* (1871); Curò, "Bull. Soc. Ent. It.," vi., p. 110 (1874), Frey, "Lep. Schweiz," p. 14 (1880); Kirby, "Eur. Butts.," p. 53 (1882); Lang, "Butts. Europe," p. 102 (1884); Kane, "Eur. Butts.," p. 35 (1885); Rühl, "Pal. Gross-Schmett.," pp. 229, 750 (1895); Tutt, "Brit. Butts.," p. 185 (1896); Staud., "Cat.," 3rd ed., p. 77, *in part* (1901); Wheel., "Butts. Switz.," p. 44, *in part* (1903); Grund, "Int. Ent. Zeit.," ii., p. 70 (1908). **Amyntas,** Schiff., "Schmett. Wien.," 1st ed., p. 274 (*teste* Bergsträsser) (1775). **Tiresias,** Bkh., "Sys. Besch.," i., p. 166 (1788). **Myrmidon,** de Sélys, "Mem. Soc. Roy. Sci. Liège," ii., pt. 1, pp. 31 *et seq.* (1845).—*P.P.R.* alis caudatis, posticis ad marginem nigro punctatis; subtus in secundo punctorum ordine stria fulva; omnibus supra (*α*) cœruleis, ♂, fig. 3; (*β*) nigro cœrulescentibus, ♀, figs. 4, 5. Wings tailed, hindwings spotted with black at the border; beneath with a reddish-yellow streak in the second row of spots; above with all the wings (α) blue in the ♂ fig. 3; (β) blue-tinted on black, ♀, figs. 4, 5.* A many-eyed species with a reddish-yellow mark on the underside of the hindwings. The underside pale, with two arcuate rows of black spots. On the upperside, the marginal spots of the ♀ hindwings are encircled with blue. The Vienna entomologists call this species *amyntas*, but, as Fabricius has already named an entirely different species *amyntas*, I have renamed it *polysperchon* to avoid mistake (Bergsträsser).†

It has been generally assumed for a long time past, that all the specimens of the spring brood of this species were referable to *polysperchon*, Bergstr., but, though the spring examples show general racial characteristics, only a very small proportion are quite of the extreme ♀ form figured under this name by Bergsträsser (fig. 5). As already noted (*suprà*), whilst many of the ♀ s of the spring brood are plentifully sprinkled with blue scales, others have little or no trace thereof, and have one or more fulvous crescents above the tail of the hindwing. The application of Bergsträsser's name to the vernal brood as a whole was made by Borkhausen, Ochsenheimer, Zeller, Staudinger, etc., the latter of whom, in his *Catalog*, ed. 2, p. 9, notes: "var. gen. 1, *polysperchon*, Bergstr., 'Nom.,' pl. xliv., figs. 3-5; Ochs., i., pt. 2, p. 61; minor." That the size definition alone has been often accepted may be judged from the fact that so good an entomologist as Aigner states that *polysperchon* is found in the 3rd, as well as the 1st, generation (expanse 20mm.-26mm.) in Hungary, and that "the ♀ frequently has the disc dusted, and sometimes strongly tinted, with blue," making it clear that he included all small examples under this name. Nor are these small examples elsewhere confined to the vernal emergence, *e.g.*, very small specimens are to be taken at Grésy-sur-Aix in August, with others of typical size (Tutt), whilst at Glanon-sur-Saône, also, with the large typical form one finds examples of small size, ♂ s 19mm.-23mm., ♀ s 18mm.-24mm., particularly during the second fortnight of August (Rehfous); near Geneva, one sometimes finds, flying with the ordinary form, ♂ s and ♀ s approaching *polysperchon* in size, among others a ♀, taken August 29th, 23mm. in expanse, sprinkled with violet-blue; others, taken September 7th, 1907, near Geneva, are of small size, and some of the ♀ s are powdered with blue, possibly a third generation (Reverdin), whilst at Crassier, at the foot of the Jura, with many of normal size, others were taken, on August 27th, of small size and sprinkled with blue (de Loriol). Oberthür's notes on the *vernalis* brood have already been quoted (*anteà*, p. 60). We strongly suspect, however, that most of the specimens referred to *polysperchon*, Bergstr., by various authors, have been so referred, on account of their small size, coupled in most instances with Ochsenheimer's and Staudinger's indication that it belongs to the spring brood. We, therefore, append the references to "*polysperchon*," culled from various authors. Thus we have *polysperchon* recorded from east and west Prussia—Jetau, Elbing, Dantzig, not rare (Schmidt), the walls of the fort Courbière at Graudenz (Riesen); in Pomerania—in the Julow and about the forts near Stettin, at the end of May, the ♀ rarer than the ♂, *amyntas* always in the same places in July; some of the spring specimens are intermediate in size between the normal spring and summer forms (Hering); in Mecklenberg, at Kleinen (Schmidt); in Hamburg, at Eppendorf (Tessien); and at Hamburg (Laplace); occurs in April and May at Hanover (Glitz); and Osnabrück (Jammerath); in the Rhine provinces pretty abundant at Trier (Stollwerck); in Hesse, at Wiesbaden, in April and May (Rössler), Oberursel (Fuchs), Hanau (Limpert and Röttelberg); around Giessen (Glaser); in the Stadwald of Frankfurt-on-Main, etc. (Koch), supposed to be the only form round Cassel, where it occurs in June, and where no second-brood examples have been found (Borgmann); in Waldeck, rare and singly, whilst the second-brood, sometimes equally rare, is occasionally pretty abundant (Speyer); in Thuringia, appears in May from hybernated larvæ (Krieghoff), rarer in the Halle district than the second-brood (Stange); in Anhalt, it is rare at Dessau, but the second-brood (*amyntas*) is rarer (Richter), whilst at Brunswick it is rarer than the second-brood (Heinemann), so also is it at Göttingen (Jordan); rare in Brandenburg, both at Frankfurt-on-Oder and Finkenkrug, as is also the second-brood (Pfützner); singly in May at Schilling, in Posen (Schultz), at Glogau (Zeller); occurs throughout Silesia in May and June, but rarer than the second-brood in the Sprottau district, etc. (Pfitzner); in the Kingdom of Saxony, at Rachlau, sometimes more abundant than the second-brood (*argiades*) (Schütze), whilst at Leipzig, Gauernitz near Dresden, at Chemnitz, etc., the spring form *polysperchon* is rarer (*Ent. Ver. Iris*). In Austria, *polysperchon* is reported as very abundant in some years, but in others very rare. Fritsch notes it from April 27th to May 16th, at Brünn; it prefers open meadows in Upper Austria, whilst the second-brood appears to be more abundant in meadows situated in woods (Brittinger), and in the Dammberg it has been noted in May up to 700 mètres (Himsl); in Lower Austria, it occurs throughout the valleys, the form *polysperchon* in some places near Vienna in swarms (Rossi); occurs in May on the mosses of Salzburg and on the Glockner (Richter), and in the Tyrol up to 4300ft., in the neighbourhood of Innsbruck (Hinterwaldner); occurs rarely in the Lavantthal (Höfner). In Hungary, Aigner-Abafi evidently refers the name to all small examples, and records it as occurring in the 1st and 3rd generations. He notes as localities Budapest, Nagyvárad, Arad, Szegedin, Pécs, Sopron, Pozsony, Tavarnok, Kocsócz, Gölniczbanja, Eperjes, Kassa, Nagyág, Réa, Ujszeged. Grund (*Int. Ent. Zeits.*, ii., p. 70) states that, near Agram, the *polysperchon* form occurs somewhat commonly from the commencement of April to the end of May, whilst the summer brood occurs from the end of June into September. One suspects that many of the French records for *polysperchon* are possibly referable to *E. alcetas*, as some French entomologists long confounded the two, but it is clear that the records from Ain—Fernex, April 25th, 1903 (Drexler); the Basses-Alpes—Digne (Rowland-Brown); Basses-

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* Bergsträsser's fig. 4 is, from the piece of upperside shown, undoubtedly a ♂.

† Of the above authors, Bergsträsser, Ernst and Engramelle, Ochsenheimer, Hübner (*Verz.*), Ménétriès, and Eversmann treat this form as a separate species. Boisduval (*Eur. Lep. Ind.*, p. 11) brackets it with *tiresias*, Hb., as a synonym, adding to the latter name "absque maculis fulvis" (*i.e.*, *alectas*). Hübner's figures, pl. 65, figs. 319-321, are certainly a small form of *alcetas*, Hffmg. (see *anteà*, p. 45), as is also the *polysperchon* of Berce (*Faun. Fr.*, i., p. 133) and of Lambillion (*Pap. Belg.*, p. 219). Meigen (*Sys. Besch.*, ii., p. 15) must also be undrstood to refer to small specimens of *alcetas*, as he gives a reference to Esp., i., pl. xlix., fig. 2, which certainly represents that species; his figures, pl. xliv., figs. 6*a*-*b*, are said to be copied from Esper but are without any "tail." The references in Speyer (*Geog. Verb.*, i., p. 250) and Leech (*Butts. of China*, ii., p. 329) are doubtful (Wheeler).

Pyrénées—Guéthary (Sheldon), Biarritz (Hinchliff); Charente-Inférieure—St. Mariens, similar to the vernal form from Rennes (Oberthür); Ille-et-Vilaine—Forest of Rennes, Monterfil, Montfort (Oberthür); Indre—Forest of Amboise (Lelièvre); Var—near Cannes (Chapman), are to be referred here; whilst other less certain records are: Allier (Peyerimhoff); Doubs (Bruand); Dordogne (Tarel); Loire-Inférieure—Nozay (Doherman-Rey); Cher, Indre, Puy-de-Dôme (Sand). In Switzerland it is recorded from Vaud—Crassier, at the foot of the Jura, in May (de Loriol), whilst in the Brit. Mus. Coll. are several examples from the Zürich district (Frey). This form is the *amyntas* of Borkhausen (and, as Bergsträsser himself notes (*anteà* p. 61), the *Papilio amyntas* of Schiffermüller is his insect, the latter name being dropped because the earlier *Papilio amyntas* of Poda and Scopoli has been referred to *Coenonympha arcania*). Borkhausen separated it as an aberration of the larger form (uniting them, however, specifically under the name *tiresias*) on the following grounds: "(1) Half the size. (2) Flies in spring when *tiresias* does not occur. (3) The female always mixed with blue above without orange spots at the anal angle. (4) The antennal club not white apically, but quite black, obtuse, and somewhat indented." Illiger, in 1801 (*Schmett. Wien.*, 2nd ed., p. 274), suspected these were merely small examples of the larger species occurring throughout the summer. Ochsenheimer mentions it (*Die Schmett.*, i., pt. 2, p. 62) as flying in the Leipzig district in April and May, two months earlier than *amyntas*, and adds that, in Schiffermüller's collection, it stood as a variety of *amyntas*. We have already noted the references in the German and Austro-Hungarian literature to this name (*anteà* p. 62), where it is clear that the authors are using the name for the smaller first-, as compared with the larger second-, brood. We have also already suggested that some of the references to *polysperchon* in the French entomological literature possibly refer to the same form, but others (possibly many) refer to *Everes alcetas*, to which species some authors certainly misapplied the name. In view of this general consensus of opinion, and of the fact that Bergsträsser's description given above is obviously not altogether in harmony with his figure of the ♀, it will perhaps be best to retain his name *polysperchon* for the small spring brood and to name the form as figured, but not as described, by him—

β. ab. *bergsträsseri*, n. ab. *Polysperchon*, Bergstr., "Nomen.," ii., pl. xliv., fig. 5, ♀ (1779); H.-Sch., "Sys. Bearb.," i., p. 129 (1843).—This is a very small ♀ form, of the same tint, and almost as blue, as the ♂ *polysperchon* figured by Bergsträsser (*Nom.*, ii., pl. xliv., fig. 3), with broad, rather broken, dark, marginal band to the forewings shading off internally, almost to the middle of the wing; the submarginal band of the hindwings, broken on the margin by a series of pale bluish crescents, outlining the usual outermarginal series of dots, which are thus rendered somewhat conspicuous.

This ♀ aberration appears only to occur with the spring form, but is rare, very few of the ♀s of the spring race being as extreme as Bergsträsser's figure.

γ. ab. *jodina*, Aign.-Abafi, "Ann. Mus. Nat. Hung.," iv., p. 515 (1906).—In the ♀ gen. vern. *polysperchon*, the forewings at the base and on the discal area, nearly to the outer margin, as well as a weak marginal stripe, are tinged with blue; the hindwings, on the contrary, only at the base, and towards the margin; the marginal dots very weak. But, in an example, taken May 14th, 1891, at Eperjes, by Dahltsröm, also a ♀, the wings are wholly tinged with blue, the costa of the hindwings alone being black, the marginal dots well developed, that at the anal angle weakly edged with yellowish-brown. It has a wing-expanse of 23mm. This form I name ab. *jodina* (Aigner-Abafi).

This is, like ab. *bergsträsseri*, an especially blue form of the ♀, but even more extreme than Bergsträsser's figure, which has a broad, though broken, dark margin to the forewings, and is not so wholly tinged with blue on the wings as Aigner has described ab. *jodina*, nor has *bergsträsseri* the anal spot on the hindwings weakly edged with fulvous or brown, as *jodina* is described as having. A similar, but (?) paler, form, bred May 9th, 1848, was described by Zeller (*Stett. Ent. Ztg.*, x., p. 181), as having the whole upperside pale blue, becoming whitish on the costa and hind margin of the forewings; the abdomen, as in *amyntas* ♂, black, basally sharply contrasted; the discoidal streak very distinct. The hindwings, broadly blackened on the costa, have, on the margin, the male markings in full sharpness; the two red spots large and more brightly coloured. The underside has nothing at all abnormal.

δ. ab. *tiresias*, Rott., "Naturf.," vi., p. 23 (1775); Bergstr., "Nom.," iii., pp. 34-5 (1779). *Puer*, Schrank, "Faun. Boica," ii., pt. 1, p. 215, ♂ var. 1 (1801). *Amyntas*, Ochs., "Die Schmett.," i., pt. 2, pp. 59-61 (1808).—*Papilio Plebejus Ruralis tiresias*. The ♂ is blue above, but the ♀ is dark brown, and has, at the anal angle of the hindwings, two small orange-coloured spots (which, however, are wanting in some examples); in some females the forewings are shot with blue at the base. On the underside both sexes are quite whitish, and have only a few scattered black dots without any white bordering. On each hindwing the two orange-coloured spots appear as above, but have beneath two small green-shining eyes as well. This insect appears beneath very similar to *Papilio argiolus*, Linn. The chief mark of distinction, however, by which this insect is separated from all other *Argus* species is a small tail, which it bears on each hindwing; it has, however, only the thickness of a hair, and is so fine that one is not aware of it when one does not look at it carefully. The insect appears in the month of July in gardens. It is rather rare (Rottemburg).

This form essentially differs from the type in the presence of the metallic green eyes to the fulvous spots on the underside of the hindwings. The name *tiresias* was applied by Esper [*Schmett. Eur.*, pl. xxxiv. (supp. x.), figs. 1-2] to an entirely different form. Bergsträsser's figures of *tiresias*, "Nom.," ii., p. 73, pl. xlv., figs. 1-4, and iii., p. 11, pl. liv., figs. 3-4, also do not agree with the form originally described under this name. Later, however, Bergsträsser recognised this, for he writes (*Nom.*, iii., pp. 34-5): "Viber writes of *tiresias* (*see* pl. xlv., figs. 1-4; pl. liv., figs. 3-4) as follows: 'The ♂ is blue above, but the ♀ dark brown, and has, on the hindwings, near the anal angle, two orange-coloured spots (although these in some examples fail). In some ♀ s the forewings are tinged somewhat at the base with blue. The underside in both cases is quite whitish, and has only some scattered black spots without white edging; on the hindwings are two orange-coloured spots as above, but containing two small shining green eyes. It comes very near, on the underside, to *Papilio argiolus*, the chief point of distinction, however, which separates this from all other *Argus* species (except *polysperchon*) is a small slender tail, not finer than a hair, etc." This quotation, ascribed to Viber, is certainly the original description of Von Rottemburg (*suprà*). At any rate, it shows that Bergsträsser, after describing other forms as *tiresias*, discovered, too late to correct what he had done, what the characters of the real *tiresias* were. Hübner, in turn, figured as *tiresias* (*Eur.*

Schmett., pl. lxv., figs. 319-321) the insect known since 1808 as *coretas*, Ochs., but Hoffmansegg, in 1804, discovered (*Ill. Mag.*, iii., p. 205) this error, and renamed the insect *alcetas*, a name adopted by Hübner in the text of his own work, in 1806 (*Eur. Schmett.*, p. 51). The name *tiresias* must stand for the aberration with glistening metallic kernels to the fulvous spots on the underside of the hindwings.

(?) ε. ab. *depuncta*, Hirschke, "Verh. zool.-bot. Gesell. Wien.," 1903, pp. 88, 270 (1903).—This is a highly interesting form of *Lycaena argiades*, Pall., from the upper Czernatal above Mehadia (Hungary), which is distinguished by its striking size, and. more especially, by the dots on the underside—as far as the central crescent—more or less entirely disappearing. This form, which was taken in numbers in the above-mentioned locality, and seems to possess the character of a local race, may be called ab. *depuncta*. A detailed account of it will follow in this publication (p. 88). Taking the opportunity during a lengthy stay in Herkulesbad, I captured in numbers, in the upper Czernatal, between May 21st and June 2nd, 1901, at the same time with ab. *decolorata*, Stdgr., a form of *argiades*, which at once struck me by its noteworthy size. Specimens set in the usual manner measure (from tip to tip of the wings) up to 31mm.; the chief distinction from the type is formed by the absence of the rows of eye-spots on all the wings. Only occasionally there is one or other of the eye-spots present mostly in cell 2. Likewise the orange-coloured marginal bands either do not occur at all or are very much reduced. The central streaks, however, are present as in the type, and the upperside of all the wings shows no variation. As I found only this form at the bottom of the valley and, on the contrary, only the type (though only smaller examples) on the heights surrounding the Czernatal, it appears that the greater humidity, as well as the circumstance of the sun's rays striking the bottom of the valley only a few hours every day, have brought about the evolution of this form, which I name ab. (et var.) *depuncta* (p. 270) (Hirschke).

This appears to be practically identical with ab. *caeca*, Aigner, in its particular feature of an almost spotless underside, but it differs in that whilst this has an almost unicolorous grey spotless underside, Aigner-Abafi's aberration has the underside covered with the white margins of the obsolete black spots, and, in addition, has the normal fulvous spots towards the anal angle of the hindwing, which Hirschke says either do not occur at all or are very much reduced in *depuncta*. One wonders whether the form be, indeed, an aberration of *argiades* at all, the statement that "the orange-coloured marginal bands either do not occur at all or are very much reduced," suggests rather that it is an aberration of *alcetas*. One wants specimens to make sure of the matter.

ζ. ab. *caeca*, Aigner-Abafi, "Ann. Mus. Nat. Hung.," p. 515, pl. xiv., fig. 5 (1906).—The underside entirely without eye-spots, only the white edgings of these being present, although here and there a very small black dot may be detected. Captured in Upper Hungary—Eperjes, July 30th, 1892, by J. Dahlström. This form may be known as ab. *caeca* (Aigner-Abafi).

This form is an underside aberration, with the black streaks and dots on the undersides of all the wings practically obsolete, only the pale margins being left. Aigner-Abafi's figure is none too well reproduced. It shows, however, the white margins usually outlining the dark streaks, on the underside of both fore- and hindwings and two pale orange crescents near the anal angle of the hindwings.

η. ab. *striata*, n. ab.—♀. 25mm. in expanse. The upperside normal; brown in colour with the bases of the wings powdered with violet-blue scales, the hindwings with one yellow spot near the anal angle. On the underside, the forewings with the black discoidal lunule and some points of the postmedian row, but a little elongated in the direction of the nervures; there are also faint antemarginal shades. Hindwings with black streaks in the place of the dots of the postmedian row; two yellow-orange spots near the anal angle. Taken at Hermance, near Geneva, in the summer (? July) by M. Roch (Blachier, *in litt.*).

ASIATIC RACES.

According to de Nicéville (*Butts. India*, iii., p. 138) this species occurs throughout Asia, but it is really very doubtful whether true *E. argiades* extends into the Oriental region, where its place appears to be taken by the somewhat distantly-allied *Binghamia parrhasius* (*anteà*, p. 42), and one suspects that it is to this latter species that he is referring when he observes (*Butts. of Sumatra*, p. 455) that, "in Sumatra, the species is common at low elevations in October and November, as usual, the ♂ s on roads, the ♀ s on flowers in small jungle." He further notes that Kheil calls *Lampides boeticus* the "*cardui*" of the Lycænids, but *Everes argiades* better deserves that epithet, as it has a still greater range, occurring in N. America under a slightly modified form (as *comyntas*, Godt.), which *L. boeticus* does not do. Dr. Martin also says that European specimens have the spots on the underside of the wings somewhat more prominent than in Sumatran examples, again probably referring to *B. parrhasius*. De Nicéville gives the following general description of the Indian forms (*Butts. India*, iii., p. 138) :

> ♂. *Upperside :* both wings blue with an outer black margin of very variable width ; sometimes with a black discocellular spot ; cilia whitish throughout ; hindwings with a more or less prominent marginal series of black spots, sometimes indistinctly crowned with orange ; the wing outwardly bounded by a very fine white line and an anteciliary fine black line ; tail very variable in length, tipped with white, the shaft more or less white. *Underside :* both wings sometimes almost pure white, often more or less sullied with brownish ; the forewing with a fine blackish line on the discocellular nervules, a discal series of spots, sometimes brownish* and confluent into a macular band, sometimes well separated, distinct, black,† surrounded by a fine white line ; two somewhat indistinct submarginal series of dark lunules, the inner series sometimes very prominent, and formed into large quadrate spots ; an anteciliary fine black line. Hindwing with the discocellular nervules defined by a narrow dark line ; sometimes with four prominent black spots only, one beyond the middle of the costa, two near the base, and one near the middle of the abdominal margin, an obscure discal irregular series of pale brown spots, the marginal series of lunules as in the forewing, bearing two prominent black spots beyond the tail, irrorated with greenish-silvery scales, and crowned broadly with orange ; sometimes with the discal irregular series of spots as prominent and as black as the rest, with a complete marginal silver-spangled series of black spots, with a broad orange band placed inwardly against them ; a fine anteciliary black line. ♀. *Upperside :* both wings sometimes entirely sooty-black, sometimes with the basal and discal area of the forewing and the disc of the hindwing blue, sometimes the entire upper surface almost as blue as in the blackest bordered ♂ s, but the blue of a different shade. Hindwing with the marginal black spots usually more prominent than in the ♂. *Underside :* both wings as in the ♀.

De Nicéville adds : "The above description is drawn up from Indian specimens only. The variations indicated appear to be confined to no particular locality, though I believe there is a very marked seasonal dimorphism in many localities, the lightest coloured ♂ s and ♀ s occurring in the dry season, the dark ♂ s and completely black ♀ s in the rains." He then goes on to say that "no author has placed *parrhasius*, Fab., and *dipora*, Moore, as synonyms of *argiades*, but no author has undertaken to show how these three species differ ; I can find absolutely no character by which to separate them ; in every direction the species is a most variable one, and these variations are not confined to any particular region or locality, though every variation could not perhaps be found in any one place . . . I have not seen any Indian specimens with no orange whatever below (=*coretas*, Ochs.), though many have this colour quite obsolescent." It has already been largely proved (*Ent. Rec.*, xx., pp. 231 *et seq.*) that *coretas*, Ochs. (= *alcetas*, Hoffmgg.) is quite distinct specifically from *argiades;* and Chapman has further proved (by means of the ancillary appendages) that not only are *dipora*, Moore, and *parrhasius*, Fab., specifically separate from *argiades*, Pall., but that *parrhasius* is comparatively only distantly allied thereto; *E. dipora*, Moore, is, however, more closely allied to *E. argiades* (*anteà* p. 50). Much trouble has arisen in the Indian area over *E. argiades*, because the latter in its form *diporides*, Chpm., appears to be more or less coincident with the true *dipora*, Moore, in the more northern part of its range; the two insects being very similar, and, in markings, differing only in the direction of the transverse row of spots near the middle of the hindwing (just as *argiades* and *alcetas* differ in the direction of the similar row on the forewings), and no author hitherto has separated these specifically distinct forms, even Moore associating *dipora* and *diporides* in his collection. As to the various races of *E. argiades* in the more northern and eastern parts of Asia, there can be little doubt of their specific unity. They are not very dissimilar from the European forms, and Elwes writes (*Proc. Zool. Soc. Lond.*, 1881, p. 887): "This species appears to be widely distributed throughout northern and eastern Asia, China and Japan. I have compared many specimens from Amurland, Shanghai and Japan, and find them so very variable both in size, colour, and the spots of the hindwing, that I am unable to see how the larger and brighter specimens, described as *hellotia*, Mén., and *praxiteles*, Feld., can be separated from *argiades;* as a rule the Oriental and Japanese specimens are larger and more richly spotted, especially at Tokio, Japan, but some of those from Askold and Shanghai are quite as small as German specimens of var. *polysperchon*, Bergs.; this variety also occurs on the Ussuri at Raddefskaia and Askold." Leech says (*Proc. Zool. Soc. Lond.*, 1887, p. 415) that "the species is common all over Japan and Corea during the warm months; it varies in size from ·75in. to 1·5in.; the ♀ also varies in colour and markings, some specimens being much suffused with blue." He further adds (*Trans. Ent. Soc. Lond.*, 1889, p. 108) that "Kiukiang examples vary greatly in size and colour." Pryer also notes that the species is "very abundant in Japan, and that a succession of broods appears during the year; they vary much in size, and ♀s are often to be found with more or less blue on the upperside" (*Rhop. Nihon.*, p. 17). Manders records *E. parrhasius* as very common in the Shan States at low elevations, and *E. argiades* as occurring equally commonly but at higher elevations, suggesting that the different habitats confirm the specific differences that exist. Elwes further notes (*Trans. Ent. Soc. Lond.*, 1899, p. 323) that the first generation was common in the Altai at Biisk, in the first week of June, 1898, whilst the second brood, much larger, was out in the Bija Valley, the first week in August. Staudinger describes a central Asiatic form, with pale greenish-blue ground colour as var. *decolor*. The central and eastern Asiatic forms are not at all unlike the Palæarctic races; the Indian race, owing to its parallelism with allied species, suggests some tendency to mimicry. The described Asiatic forms are as follows:

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* Apparently this refers to *parrhasius*.

† This probably belongs to true *argiades*.

α. var. *decolor*, Staud., "Stett. Ent. Ztg.," 1886, p. 203 (1886); Rühl, "Pal. Gross-Schmett.," p. 229 (1895); Tutt, "Brit. Butts.," i., p. 186 (1896); Staud., "Cat.," 3rd ed., p. 77 (1901).—In 1883, I received from the neighbourhood of Margelan a small number of *E. argiades* belonging to the smaller first brood var. *polysperchon*. They differ essentially from the latter only in the totally different tint of the blue of the ♂, which, in this form, var. *decolor*, is of a light greenish-blue, whereas in *argiades* and *polysperchon* it is violet-blue. In *decolor*, too, the black outer border is wider and more sharply defined, and the underside is grey-white, without any greyish suffusion. The only ♀ of *decolor* before me is absolutely without any blue suffusion on the dark upperside, but before the (damaged) outer margin of the hindwings stand three or four eye-spots, finely surrounded with blue. [Occasional examples of *coretas* from Vienna, Hungary, or Bulgaria, have a similar greenish-blue coloration, and these I call ab. (or var.)*decolorata*.*] (Staudinger).

β. var. *amurensis*, Rühl, "Pal. Gross-Schmett.," i., p. 751 (1895); Tutt, "Brit. Butts.," p. 186 (1896).—Large, with very uniform white-grey underside; bases of wings hardly tinged with bluish-green; the reddish spots form a very distinct band on the hindwings of both sexes; in the ♀ this band extends to the forewings, although paler; similarly also on the underside of the hindwings. Amur (Rühl).

This appears to be little different from the strongly-marked Japanese examples generally referred to *hellotia*. T. B. Fletcher notes that the species was "common all the summer of 1898, at Wei-hai-Wei; the specimens appearing to be referable to the var. *amurensis*, Rühl, though the size varies greatly. This form is characterised by a very uniform whitish-grey underside; the pale red spots form a very distinct band on the hindwings of both sexes. The vernal examples at Wei-hai-Wei have these spots paler than those disclosed later in the season." Later, he adds (*Ent.*, xxxiv., p. 156) that "there are apparently three broods here, April, June, and September, and the forms *amurensis*, Rühl, and *hellotia*, Mén., occur." This also appears to point to *amurensis* being practically synonymous with the Japanese var. *hellotia*.

γ. var. *hellotia*, Mén., "Cat Lep. Mus. Pet.," pl. x., fig. 6, pp. 84, 124 (1857); Butl., "Ann. Mag. Nat. Hist.," 2th ser., ix., p. 17 (1882); Rühl, "Pal. Gross-Schmett.," p. 751 (1895); Tutt, "Brit. Butts.," p. 186 (1896). *Argiades*, Elwes, "Proc. Zool. Soc. Lond.," p. 887, *in part* (1881); Leech, "Proc. Zool. Soc. Lond.," p. 415 (1887); Pryer, "Rhop. Nihon.," p. 17, pl. iv., figs. 23*a-b* (1888); Leech, "Butts. China," etc., ii., p. 328, *in part* (1894).—♀. *Lycaena hellotia*, n. sp. Described from an example 14 lines in expanse. The upperside of a very dark brown, with blue reflexions at the base: at the anal angle of the hindwings, a black dot, surmounted by a tawny crescent. The underside shiny, slightly tinged with bluish; the forewings without streaks or dots at the base, the discoidal streak poorly developed, beyond which is a row of six strongly-marked black streaks, whilst near the outer edge are only traces of two or three brown streaks, edged with tawny exteriorly, and placed near the inner angle. In the hindwings are two black points nearer to the base than the disc, but there is no trace of the discoidal crescent; a transverse row of very black dots, disposed thus—∽, of which two are near the outer angle, four round the disc, and three lower, near the anal angle; lastly on the outer margin, and towards the inner angle, are two black dots, each surmounted by a fulvous spot, bounded above by a very narrow black streak, whilst beyond these, on the outer margin, are two weaker fulvous spots. This species, brought from Japan, has been given to us by Mr. Goschkevitsch (Ménétriès).

Though only described from a single ♀, there is no doubt that this is the rather large, strongly-marked, eastern Palæarctic form of the species, with well-developed orange markings, which appears to be widely distributed throughout the whole of Eastern Asia, and is usually somewhat larger and brighter than the average examples from Europe, although almost as variable as these. Pryer says that, in Yokohama, the species is very abundant, occurring from March to October, in a succession of broods. The examples vary much in size, and ♀ s are often to be found with more or less blue on the upperside. T. B. Fletcher found the insect, very worn, at Yokohama, September 14th, 1899. Leech observes that he has received specimens from all the localities in China and Japan visited by his collectors; he says that examples as small as ab. *polysperchon*, Bergs., are of common occurrence; but he specially notes that he has not seen the var. *coretas*, Ochs., from any eastern localities. Some ♂ s taken by himself in Japan have red lunules on the upper surface of the secondaries as in the ♀ s, whilst Nagasaki specimens attain a wing expanse of 1·5in. It is also common in Corea and Amurland. Elwes notes that he has compared many specimens from Amurland, Shanghai (the native land of the original *praxiteles*), and Japan (the native land of the original *hellotia*), and has found them so variable, both in size, colour, and the spots of the hindwing, that he is unable to separate the larger and brighter specimens, known as *hellotia* and *praxiteles*, specifically, from *argiades*. As a rule the Oriental or Japanese examples are larger and more richly spotted, especially at Tokio, but some of those from Askold (Jankowsky) and Shanghai (Pryer) are quite as small as German specimens of *polysperchon*. This variety, he says, also occurs on the Ussuri at Raddefskaia.

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* It has since been proved (*Ent. Rec.*, xx., pp. 231 *et seq.*) that *coretas* (=*alcetas*) and its ab. *decolorata*, are specifically distinct from *argiades*.

δ. var. *praxiteles*, Feld., "Verh. zool.-bot. Gesell.," xii., p. 489 (1862); "Reis. Nov. Lep.," p. 281, i., pl. xxxv., fig. 5 (1865). *Argiades*, Elwes, "Proc. Zool. Soc. Lond.," p. 887, *in part* (1881); Leech, "Butts. China," etc., ii., p. 328, *in part* (1894).—♂. *Lycaena praxiteles*, n. sp. Alis supra violescenti-cæruleis, omnibus anguste fusco marginatis, subtus albidis, litura discali tenuissima brunnescente, punctis exterioribus fuscis, albocinctis, anticis maculis exterioribus diffusis aliisque multo minoribus submarginabilus seriatis fuscis; posticis punctis duobus basalibus unoque subapicali, subcostali atris albo cinctis, lunulis duabus maculisque tribus pone eas in margine apicali, dein maculis biseriatis atris limbi postici taeniolam aurantiacam includentibus ♂. Taken by Frauenfeld at Shanghai (Felder, "Verh. zool.-bot. Gesell.," xii., p. 489 (1862).

This was described from a single ♂ specimen captured at Shanghai, and appears to be typical of the smaller form of the species taken in China and Japan, sometimes racially, and sometimes merely mixed with the larger and more strongly marked var. *hellotia*. It seems to be widely distributed throughout the east and in no wise confined to China.

ε. var. *diporides*, n. var. *Amyntas*, Koll., "Hügel's Kaschmir," etc., p. 421 (1848). *Parrhasius*, Elw., "Trans. Ent. Soc. Lond.," pp. 382-3, *in part* (1888). *Argiades*, de Nicé., "Butts. India," iii., p. 138, *in part* (1890); Manders, "Trans. Ent. Soc. Lond.," p. 528 (1890).—Notwithstanding that *dipora*, Moore, and *parrhasius*, Fab., have been sunk as forms of *argiades* by de Nicéville, Elwes, and others, the general consensus of opinion has recognised *parrhasius* as distinct. It seems difficult to understand how any doubt could have arisen, but any that could possibly survive is dissipated by the very distinct form of the genitalia. It is a tropical rather than a subtropical species, with distribution from India to Australia. *Dipora*, with a North Indian distribution, has a facies different from that of *argiades* (ordinary form) in a darker, more leaden-blue colour, and a wider dark border to the wings, often a very wide one: the genitalia, however, differentiate it from *argiades*. The remarkable circumstance is, however, that in the same region there occurs a race of *argiades* that almost exactly resembles it, the only reliable difference in wing-marking being in the line of extra-mesial spots beneath the hindwing, such that the spot in the space between veins 2 and 3 is in *argiades* var. *diporides* close to the discal line, whilst in *dipora* it is remote from it. These two forms occur throughout a considerable portion of the northern hills of India, frequently, probably, in different habitats, which may account for Mr Elwes meeting apparently with *diporides* and not with *dipora*—at least specimens in the British Museum collection taken by Elwes are *diporides*—and, as a result, for his disbelief in *dipora* being distinct from *argiades*. They occur, however, apparently in habitats if not identical at least near together, and the two forms have all the appearance of being mimetically associated. Although *dipora* is quite unrelated to *alcetas*, one cannot but be struck with the fact that there is some parallelism in the relations of *argiades* and *alcetas* in Europe with those of *argiades* var. *diporides* and *dipora* in Northern India. Localities: Cherra Punja, Assam, Khasia, North-west India, North-west Himalayas, North Shan States (*teste* examples in Bethune-Baker and Moore colls.) (Chapman).

This is really the Indian form of *E. argiades*. It must not be confounded with *dipora*, Moore, which also comes from the north-west Himalayas, Khasia, Kulu, Kashmir, North India, Simla, Campbell-pore (*teste* examples Moore and B.-Baker colls.). It is, as pointed out above, the insect to which Elwes most probably refers (*Trans. Ent. Soc. Lond.*, 1888, pp. 382-3), when he writes: "This is a tropical form of the wide-ranging *L. argiades*, Pall., which occurs in the north-west Himalayas under the name of *dipora*, Moore; it seems rare at Sikkim at low elevations, but is very common on the Khasia hills in August and September, at 4000ft.-6000ft. on the grassy downs . . . . The summer brood examples from the Himalayas and Khasias are certainly darker below, and have a broader dark border to the wings above than European *argiades*. The red patch on the anal angle of the hindwing below is also better marked; but the examples of the spring brood in the north-west Himalayas differ from those of the summer one, as the German spring form (*polysperchon*) differs from the summer form (*argiades*)." It appears to have been first described by Kollar, in *Hügel's Kaschmir*, etc., p. 421, where it is stated that Hügel brought back this butterfly in both sexes from Massuri in the Himalaya. Kollar says that it differs from the European examples by its smaller size, by the darker blue colour of the ♂ on the upperside, darker ground colour, and, finally, by the reddish-brown band on the outer margin of the hindwings appearing of greater extent and darker coloration. He adds that the position of the spots accords perfectly with that in our European examples, so that it appears to him that the above-mentioned differences are not sufficient to establish it as a separate species.

NEARCTIC FORMS.

Our knowledge of the American Everids is most unsatisfactory. Oberthür and Bethune-Baker agree with many other lepidopterists that *comyntas*, Godt., is merely the Nearctic form of this species. Godman and Salvin observe (*Biologia Centrali Americana*, ii., p. 108) that they notice no material difference between specimens from different parts of its wide area of distribution (British Columbia to Costa Rica), except that the ♀s from the north have the wings of an uniform dark fuscous-brown, whereas, in those from the south, the base is extensively suffused with blue. In Guatemala, *comyntas* is an inhabitant of the mountain region, and is chiefly found at an elevation of 3000ft. and upwards." Dyar, Scudder, and others treat *comyntas* as distinct from *argiades*, without, however, assigning any reason, and also look upon *amyntula* as a species separate from *comyntas*. Chapman writes (*in litt.* 25, ix, '08) that "an examination of the ancillary appendages of *argiades* and *alcetas* from Europe shows that these are distinguishable without intermediates; in Japan only *argiades* appears to occur; in Western America (Calgary, California, etc.), a form (sent under the name of *amyntula*) is, perhaps, in these organs rather nearer *alcetas* than *argiades*, whilst in Eastern America, specimens labelled *comyntas* have them decidedly nearer *argiades*. This form continues south to Texas and Honduras; in Costa Rica it is *argiades* rather than *alcetas*, but varied so as to be possibly distinct, certainly a marked geographical race. Considering there are geographical reasons to explain these slight differences between *comyntas* and *amyntula*, one regards the whole race in America, including portions of Central America as one species, the ancillary appendages not very distinct in the eastern examples from *argiades*, or in the north-west from *alcetas*." We can quite easily distinguish *argiades* from *alcetas* on wing-markings, but cannot do so in the case of many American *comyntas*, although some of the American specimens in the British Museum coll. are, in this respect, not at all typical. Bethune-Baker (*in litt.* 23, ix, '08) expresses the conviction that *comyntas* is co-specific with *argiades*, and notes: "From the underside I do not think I could separate *argiades* and *comyntas* at all, though I could generally from the upperside: the genitalia I consider inseparable." Oberthür writes (*in litt.*, 27, xi, '08) that it appears to him that "*comyntas* and *amyntula* belong to the same species, both being merely American forms of our Palæarctic *argiades*," this opinion being based on many examples from different American provinces. Chapman's view, that we have, in America, a species not really separable from *argiades*, but exhibiting in its ancillary appendages a range of variation not observed in Asia and Europe, and Bethune-Baker's strongly expressed opinion, leave us no choice except to note the various American forms, about which, however, little is really known. Edwards observes (*Can. Ent.*, viii., p. 203) that, in West Virginia, *comyntas* is dimorphic in the ♀, most of the sex there being black, others blue with black margins. Scudder adds (*Butts. New Engl.*, ii., p. 917) that the same is the case occasionally on Long Island, but he has not observed it elsewhere. Of its seasonal variation, Scudder observes (*op. cit.*) that, although the insect is many-brooded, no distinctions have as yet been pointed out in its successive broods, as is the case with European examples. He, however, notes that, in specimens from the west of North America, the whole upper surface of the wings has a hoary aspect, and the dark spots of the underside are remarkably faint; southern examples, he says, differ in the less depth of the purplish tint of the upper surface of the wings in the ♂, the narrower dark bordering of the same, and in the purer and more uniform satin-grey of the underside of the wings in both sexes. Although the spring brood appears, as a rule, in Asia and Europe, to be on the whole smaller than the summer brood, this does not appear to be so in North America, but Edwards avers (*Can. Ent.*, viii., p. 203) that, wherever *comyntas* appears, two sizes of the butterfly are to be found, one of scarcely more than half the superficial area of the other, and Scudder supports this (*op. cit.*), adding that this great disparity in size is marked, because there seems to be no regular gradation between the two, merely two distinct sets in size. He dissents, however, from Edwards' statement, that these two sizes occur everywhere and has himself only noted them from Long Island and Cape Cod, and thinks they are confined to the autumn brood.[*] The variation in the size of the autumnal specimens in Europe has already been noted (*anteà* pp. 59, 60). The following are the notes that we have collected on the American forms of the species :

a. var. (an spec. dist.) *comyntas*, Godt., "Enc. Méth.," ix., pp. 660 ; Latr., l.c., 608 (1819); Bdv. and Le Conte, "Lep. Amer. Sept.," pp. 120-1, pl. xxxvi., figs. 6-9 (1833) ; Dbldy., "List Lep. Brit. Mus.," ii., pp. 43-4 (1847) ; D'Urb., "Can. Nat.," v., p. 246 (1860) ; Morr., "Syn. Lep. N. Amer.," p. 83 (1862) ; Harr., "Ins. Inj. Veg.," 3rd ed., p. 275 (1862) ; "Entom. Corresp.," p. 275 (1869) ; Kirby, "Syn. Cat. Lep.," p. 356 (1871) ; Scudd., "Syst. Rev. Am. Butts.," p. 35 (1872) ; Abb., "Can. Ent.," iv., p. 87 (1872); Edw., "Can. Ent.," viii., pp. 202-5 (1876) ; Aar., "Can. Ent.," ix., p. 200 (1877) ; Scudd., "Butts.," pp. 130, 152, 308, fig. 125 (1881) ; Middl., "Rep. Ins. Ill.," x., pp. 95-6 (1881) ; Edw., "Can. Ent.," xvi., p. 84 (1884) ; Fern., "Butts. Maine," pp. 91-3, fig. 32 (1884) ; French, "Butts. E. Unit. States," pp. 292-4, fig. 81 (1886) ; Mayn., "Butts. N. Engl.," p. 40, pl. v., figs. 50-50*a* (1886); Godm. and Salv., "Biol. Centr. Amer. Rhop.", ii., p. 108 (1887); Scudd., "Butts. N. Engl.," ii., pp. 911 *et seq.*, pl. vi., figs. 9-10 (1889) ; "Brief Guide, etc.," p. 123 (1893) ; Ckll., "Trans. Am. Ent. Soc.," xx., p. 355 (1893); Grant, "Can. Ent.," xxix., p. 208 (1897); Williams, "Can. Ent.," xxxv., p. 187 (1903).—*Polyommate comyntas.*—Dessus des ailes d'un bleu-violet chez le mâle, d'un brun-noirâtre chez la femelle ; leur dessous d'un gris-bleuâtre et ocellé de noir ; celui des inférieures offrant à l'angle anal deux lunules fauves, chargées chacune d'un œil doré (Latreille, *Enc. Méth.*, ix., p. 608). *Polyommatus.*—Alis supra maris violaceo-cæruleis, feminæ fuscis ; subtus canis, nigro ocellatis ; posticis lunulis duabus anguli ani fulvis ocello inaurato singulatim foetis. It only differs from *amyntas* in that the two fulvous lunules on the underside of the hindwings are each supplied with a black eye and golden iris, instead of there being merely a black dot. It is found in North America. OBSERVATION : How can one really distinguish between *amyntas* and *polysperchon* of Ochsenheimer ? Can one assume as a difference the lack, probably accidental, of the tawny tip which terminates the antennæ (Godart, *Enc. Méth.*, ix., p. 660). ACCESSORY SEXUAL PECULIARITIES.—Scattered upon the upper surface of the wings, apparently with no regularity nor selection of place, are androconia of the normal battledore shape (pl. 46, fig. 31), the lamina with equal sides, broadly rounded apex, scarcely longer than broad, and studded with about fifteen closely crowded rows of bead-like dots, arranged longitudinally and regularly ; stem less than half as long as the lamina, expanding gradually as it joins it. They are much smaller than the ordinary scales, averaging about ·008mm. in breadth. EGG (pl. 65, fig. 20).—Surface covered uniformly both above and on the sides with raised, rounded, bulbous points, higher on the sides than on top, arranged in tolerably regular oblique rows, and averaging ·04mm. in distance apart ; these are connected by fine raised ridges of much less elevation, forming tolerably regular cells, the surface of which is delicately punctate. Colour delicate pea-green, the elevated portions white. Toward the micropyle (pl. 68, figs. 5, 12) the tubercles become smaller and closer, and are more irregularly placed, and the cells of course become smaller and often pentagonal. The micropylic space is sharply bounded by an angulate periphery, is about ·01mm. in diameter, greener in colour, with a tracery similar to that of the neighbouring parts, but still smaller and more delicate, the cells averaging about ·01mm. in diameter, and only the outer ones punctate. Diameter of egg, ·5mm. ; height,

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[*] All these facts could be accounted for on the supposition that the larvæ regularly (or, if Scudder's view be correct, those of the autumn brood only, supposing there are but two broods), divide into "forwards" and "laggards," the former feeding up quickly and producing in consequence small imagines, while the latter feed up more slowly and emerge as large imagines at the same time as the small "forwards" of the following brood (Wheeler).

·22mm.; height of tubercles ·02mm. CATERPILLAR.—*First stage:* Head (pl. 79, fig. 36) black, nearly as broad as body. Body pale green, subcylindrical, nearly equal. Legs luteous. Length ·75mm. *Third stage:* Head piceous, deeply and narrowly cleft at the crown, smooth, with a very few rather long, extremely delicate, hairs. Body rusty-brown in short longitudinal patches, edged with pallid yellow, with a darker dorsal stripe outwardly edged with dull pallid yellow; the lower portion of the sides with a series of darker oblique stripes, forming a broken suprastigmatal series; annuli dusky, hairs pellucid; spiracles luteous, with a narrow fuscous ring. Legs and prolegs pallid green. Length 3mm. Breadth of head ·35mm. *Fourth stage:* Head piceous, body pale green with a darker green dorsal stripe, broadest on the thoracic segments, somewhat pallid subdorsal ridges, and the sides tinged with griseous from the numerous dusky ringed annuli and papillæ. Caruncles of 8th abdominal segment (first noticed in third stage) pallid, the spicules orange or pale salmon; when at rest they are not wholly withdrawn, but look like fleshy cups with corrugated edges, and are a little more than 1mm. in diameter; midway between spiracles of same segment is a long, erect, tapering, straight, spiculiferous, needle-like spine, of a dusty colour, and about as long as the longest hairs. There is also a broad, transverse cleft between the spiracles of the 7th abdominal segment, occupying at least a third of the space between the spiracles. *Last stage* (pl. 75, figs. 37, 44): Head (pl. 79, fig. 38) piceous; labrum pallid at base, beyond dark castaneous; antennæ pale; ocelli black; mouth-parts pale green. Body dark green, with a fuscous dorsal stripe from the second thoracic segment backwards, enforced by black points, especially near the edges of the segments. Whole of first thoracic segment infuscated. Sides of the abdominal segments between the spiracles and the pallid green infrastigmatal fold dull vinous, becoming brownish posteriorly; sides above spiracles marked with a couple of bands of short, pale brownish-fuscous lunules, separated from each other by their own width, the convexity upward, each upper lunule of one segment also forming, with the lower lunule of the next succeeding segment, an interrupted oblique line, alternating with a series of oblique pale lines. Whole body, between the stigmata and the dorsal stripe, and especially at the edges of the latter, besprinkled with pallid stellate papillæ, each bearing a short brown spiculiferous hair, and with black, stellate, papillate points, bearing a shorter brown spiculiferous hair. Legs green, with long castaneous claw; prolegs green. Length 7·5mm., breadth 2·5mm. CHRYSALIS (pl. 84, figs. 42, 47, 48).—Pale green, the abdomen brownish-yellow, the thorax and wings distantly and minutely spotted with blackish-fuscous; wings with about three narrow longitudinal, blackish bands, oblique with respect to the body extending from below upward and backward; a blackish dorsal stripe, interrupted on the abdominal segments; a suprastigmatal series of rather short, oblique, blackish dashes on the abdominal segments, and a longitudinal dash in its continuation on the metathorax; hairs white, the spicules blackish; spiracles luteous. Length 7·25mm.; breadth at abdomen, 1·75mm.; length of thoracic hairs, ·6mm.; length of abdominal hairs, ·5mm.; height at abdomen, 1·5mm. (Scudder). FOODPLANTS.—Various leguminous plants—*Lespedeza capitata* (Harris), *Phaseolus perennis* (Strecker), *Desmodium marylandicum* (Edwards), *Galactia* sp. (Abbot), *Trifolium* (Edwards), *Astragalus leucopsis* (Wright). DISTRIBUTION.—Throughout the Alleghanian and Carolinian dist., occurring north and south of this, and extending from the Atlantic to the Rocky Mountains, and in the north to the Pacific. Taken as far north as Great Slave Lake (Ross, "Brit. Mus. Coll."), Devil's Portage, Liard River, lat. 59° 25′ N., long. 126° 10′ W. (McConnell), the mouth of the Saskatchewan river (Scudder), Dufferin and Woody Mountain (Dawson), London, Ontario, not very common (Saunders), Toronto (Williams), Orillia (Grant), Ottawa (Fletcher), Chateauguay Basin (Jack), Montreal, rare (D'Urban). Westward it extends in abundance to the central part of the continent—Wisconsin (Chamberlin), Iowa (Allen), Missouri (Mich. Univ. Mus.), Kansas (Snow), Colorado, occasional (Mead), Rosita (Nash), Fort Niobrara, Nebraska (Carpenter), Dakota and Montana (Edwards), California—San Bernardino (B. M. Coll.), British Columbia (Mead). Eastward it extends to the Atlantic, occurring throghout New England, including the White Mountain district, common (Scudder), Pennsylvania, Maine—Auburn (Fernald), Portland (Lyman), West Virginia (Edwards). Southward it occurs as far as Nicaragua, Honduras (Brit. Mus. Coll.), Southern Mexico, Guatemala and Costa Rica (Godman and Salvin); the Gulf of Mexico, Florida—Apalachicola (Chapman), Alabama (Gosse); Mexico—Cordova (Rümeli), Jalapa (Schaus); British Honduras — Corosal (Roe); Guatemala — Polochic and Motagua Valleys (Godman and

Salvin), Tamahu, Cahabon, Purula, San Geronimo, Guatemala City, Dueñas, Zapote (Champion); Honduras—San Pedro (Whitely); Nicaragua—Chontales (Belt); California—San Francisco (Rogers); San Blas, Sierra Madre de Tepic (Richardson), Cuernavaca, Orizaba (Godman), Atoyac, Zeapa (Smith); Ruabon I. (Gaumer); Arizona—Fort Grant (B. M. Coll.).

Godart's remark, suggesting that the difference between *comyntas* and *amyntas* (*argiades*) is merely the *tiresias* character of having golden metallic spots on the underside of the hindwings, near the anal angle, is to be noted. Scudder gives (*Butts. of New Engl.*, ii., pp. 911 *et seq.*) not only the lengthy details already quoted (*suprà*) of its life-history, distribution, etc., but also a very full description of both sexes, too long, however, to be transcribed here, but to which reference certainly should be made. He also adds the following interesting details of measurement:

MEASUREMENTS IN MILLIMETRES.	MALES.			FEMALES.		
Length of tongue, 6mm.	Smallest.	Average.	Largest.	Smallest.	Average.	Largest.
Length of forewings	9·5	13·25	15·25	10	12·5	15
,, antennæ ..	4·75	6	7·25	4·5	5·75	7
Hind tibiæ and tarsi	2·25	3·6	3·8	2·5	3·35	3·75
Fore tibiæ and tarsi	1·75	2·3	2·8	1·8	2·35	2·5

Few other details are obtainable, and, as we have before noted, the further study of the species in America is eminently desirable. Oberthür, who has this form from Massachusetts, Texas, California, and British Honduras, says (*in litt.*) that it is "smaller than *amyntula*, although the blackish marginal border is wider; there is a trace of reddish-orange spots on the upperside of the hindwings, near the little tail; the ♀ is black, suffused slightly with blue on the upperside; on the underside, the black mark, surmounted with reddish-orange, carries a shiny metallic dot. 2 ♂ s, 2 ♀ s, Boisduval coll.; 4 ♂ s, 2 ♀ s, Guenée coll."

β. var. (an spec. dist.) *amyntula*, Bdv., "Ann. Soc. Ent. Fr.," p. 294 (1852); Edw.," Can. Ent.," xvi., p. 112 (1884); Fletcher, "Can. Ent.," xxvii., p. 315 (1895); Wolley-Dod, "Can. Ent.," xxxiii., p. 167 (1901); Dyar, "List Nth. Amer. Lep.," p. 45 (1902).—*Lycaena amyntula.*—Un peu plus grand que notre *amyntas*, et très voisin du *comyntas* des Etats-Unis, dont il n'est peut-être qu'une variété. Il en diffère en ce que le mâle n'a pas de lunules fauves en dessus, en ce que le dessous des deux sexes est plus blanc, avec les points plus petits, et enfin, en ce qu'il n'y a que la lunule anale qui soit saupoudrée d'atomes dorés (Boisduval). Alberta (Wolley-Dod), Arizona (Grinnell), California (Boisduval), San Francisco, Pasadena, Idlewild, San Diego Co. (Grinnell).

Oberthür, who possesses Boisduval's type of this insect, notes it as a "♂ from California, of large size, on the upperside of a blue, slightly lilac, tint, the black marginal border very wide; the underside white, slightly grey, with the ordinary black points small, and with two yellow-orange marks, one of them large, near the tiny tail, and the other, less accentuated, by the side of the larger one." Oberthür further notes that he possesses the same form from Arizona, California, and Mexico. This appears to be not only the Pacific States' form of the species but also the Western Canadian form, according to the American authors. Edwards says (*Can. Ent.*, xvi., p. 84) that, according to Wright, the larva eats into the pods of *Astragalus*, and lives on the young and immature seeds, whilst Fletcher notes (*Can. Ent.*, xxvii., p. 315) that this is the common tailed blue, not only of Southern Manitoba, but at Winnipeg, and as far east, at any rate, as Nepigon, north of Lake Superior. The eggs are laid on the pedicels of the flowers of *Lathyrus ochroleucus*, in identically the same manner as is done by the same species in British Columbia, on the pedicels of the same plant and of the allied *Lathyrus venosus*.

γ. var. *herrii*, Grinnell, "Can. Ent.," xxxiii., p. 192 (1901); Dyar, "List Nth. Amer. Lep.," p. 45 (1902).—*Lycaena amyntula* var. *herrii*, n. var. ♀, expanse 1·25in.; differs from typical *amyntula* by the replacement of the dark area of the primaries by a narrow black band, about 1mm. wide, and on the secondaries by only two red crescents instead of five, as in the typical *amyntula*. On the underside the markings are all much heavier. ♂, expanse, 1·00in.; differs from ♂ of typical *amyntula* in having a black margin about 1mm. wide, whereas there is none in typical *amyntula*, or, if any, a very slight trace; on the underside the markings are much more heavy. The male of this variety is also much smaller than the male of typical *amyntula*, and the tails seem more distinct in this variety. Habitat, Cochise Co. Arizona. Described from two ♂s and two ♀s in the collection of C. W. Herr and the writer, taken July, 1899, and September, 1900, by Mr. Poling (Grinnell).

δ. var. (an spec. dist.) *monica*, Reak., "Proc. Ac. Nat. Sec. Phil.," p. 244 (1866); Dyar, "List Nth. Amer. Lep.," p. 45 (1902).—♂. Upper surface rosy-violet, covered with an ashy hue, darker towards the base; a narrow terminal black line runs along the outer margin of both wings; near the anal angle of the hindwings this is preceded by a narrow white line, above which there are two rounded black spots, the interior being the largest; hindwings with a single tail, black, tipped with white. Fringe brownish. Expanse 1·05-1·12 inches. Underneath whitish ash-coloured; a long discoidal streak, and three transverse rows of dark and ash-coloured dashes, of which the two outer are close together, running parallel with each other, and also with outer margin, to which they are very near; the inner one is midway between the margin and the discal bar; it is slightly sinuated; each of these rows is composed of six oblong dashes, all being surrounded by whitish lines from the ground colour. On the secondaries there are also three transverse maculated bands, containing the same number of spots, but differing in shape; those of the inner row only are oblong, those of the central being lunulate, and of the outer rounded; the two interior spots of the marginal row are jet black, glossed over with some greenish metallic atoms, and are surrounded by two large orange-yellow lunules; a discoidal bar as on the primaries, and three rounded black spots encircled with whitish, situated transversely near the base, one on the costa, another within the cell, and the third on the inner margin; a similar spot, sometimes only ash-coloured, on the middle of the costa; a narrow terminal line along the outer margin of both wings; tail as above; fringe brownish-griseous. Body above black, with some reddish-violet hairs, underneath whitish; antennæ brown with white annulations, club reddish-ochreous. The female is larger—expanse 1·20 inches, and has the two black spots on the upperside of the secondaries surmounted by orange lunules, sometimes indistinct. Hab.: California. In Coll. Tryon Reakirt. Belongs to the group of which *comyntas* is the type. It is more nearly related to the following new form (*tijua*) than to either that species, or its Californian prototype—*amyntula* (Reakirt).

ε. var. (an spec. dist.) *tijua*, Reak., "Proc. Ac. Nat. Soc. Phil.," p. 245 (1866).—♂. Upper surface very similar to that of *monica*, but with more of a bluish tinge; a narrow terminal line as in that species, but edged anteriorly with white, over the whole length of the secondaries, upon which there is only one black spot; tail double the length of that in *monica*; fringe whitish, on the secondaries cut with black at the ends of the veins. Underneath there are three transverse bands on each wing, as in *monica*, but arranged differently; the spots of the two exterior on the primaries are almost confluent, and the inner one is broken into two divisions, the spots in each running together, the upper consisting of four, and the lower, which is nearer to the base, of two; a discoidal bar, and a small spot on the costa, between this and the inner transverse band. On the secondaries the two outer rows remain the same, having, however, but one large black spot, surmounted by a very large pale orange-yellow lunule; rarely there are traces of another yellow spot interior to this; the inner band is formed very irregularly, and presents very much the appearance of a W; discoidal bars and basal spots as in *monica*. Hab.: California. In Coll. Tryon Reakirt (Reakirt).

UNDERSIDE MARKINGS OF EVERES ARGIADES AND THE ALLIED SPECIES.—The underside of *E. argiades* is bluish- or greyish-white; all the wings with a slender black discoidal lunule; the forewings with a straight subterminal transverse row of seven shorts streaks with white edges, and faintly marked marginal lunules; the hindwings with a curved submarginal row of white-ringed dots, the inmost one of the four round the discoidal far up, and almost touching the latter; those of the marginal series near the tail edged with orange crescents and sometimes centred with metallic scales; two small basal and two costal white-ringed dots. The dots of the allied *E. alcetas* are much rounder and less lineated, and in the subterminal row on the forewing the dots form a bent rather than a straight series, being curved beneath as the row passes the middle of the wing, and then continued on to the inner margin. Chapman gives (*in litt.*) the following tabulation of the underside markings of the Everids:—

1. Spot between nervures 2 and 3 of the hindwings (the 4th of the row of four round discal cell) close to the discal line—*argiades, alcetas, fischeri.*
    - (*a*) Tail short—*fischeri.*
    - (*b*) Tail longer, slender—
        - (*x*) No orange spots; spot between nervures 2 and 3 of forewings advanced inwards—*alcetas.*
        - (*y*) Orange lunules above the marginal dots near tail of hindwing; spots on forewing nearly in line—*argiades.*
2. Same spot moderately close—*minimus.*
3. Same spot remote—*dipora, parrhasius.*
    - (*a*) Spots black—*dipora.*
    - (*b*) Spots pale—*parrhasius.*

As a comparison between the underside markings of *argiades* and *alcetas* the following appears to hold good:—

Argiades—
† Orange spots present on underside.
* Long, slender tail.
†† Row of spots beneath forewing in fairly regular alignment.
** Row of spots on hindwings with spot 4 (between nervures 2 and 3) close to discal line.
*** Spots black, more often elongated than rounded.

Of these characters, those marked "*," "**," "***," are constant; while those marked "†" and "††" distinguish *argiades* from *alcetas*. A few aberrations of *argiades* in the character marked "†" sometimes approach *alcetas*. In the character marked "††" *alcetas* may approach *argiades* more often than *argiades* approaches *alcetas*. In either a fairly intermediate position is rarely passed.

EGGLAYING.—Zeller observes (*Stett. Ent. Ztg.*, x., pp. 177 *et seq.*) that the species is common at Glogau; that, when egglaying, the ♀ flies slowly about the plants of *Lotus corniculatus*, seeking out the youngest flower-buds, crawling over the plant selected, and, when the desired bud is found, bending the abdomen well beneath the bud, fixing the egg thereto almost immediately; more rarely the egg is laid on the upperside of the bud, or between the petals of an already-open flower, or on a leaf. He states that he more often discovered the eggs

Explanation of Plate V.

Fig. 1. Everes argiades ♂. Wiesbaden, spring brood. Typical.

,, 2. E. argiades ♂. Wiesbaden, summer brood. Typical.

,, 3. E. argiades ♀. Eperies. Typical.

,, 4. E. argiades ♀. Guéthary (ova), bred in England by H. Main. Typical.

,, 5. E. argiades ♂. Rennes, with rather marked bend in submedian row of forewing dots (approaching the form of *alcetas*), but showing well the uniform curve of 4 equidistant dots below the discoidal lunule of hindwings.

,, 6. E. comyntas? ♂. Costa Rica. The 4 dots forming curve below discoidal lunule of hindwing should be equidistant as in *argiades*. The genitalia of this specimen figured *Trans. Ent. Soc. Lond.*, 1908, pl. xx., fig. 7.

,, 7. E. amyntula ♂. Calgary, 29, v, 1897. Uufortunately the figure fails to show how the 3rd and 4th spots of the submedian row of hindwing are moved towards the base, the 4th touching or encroaching on discal line, the small spots having failed to to come out in the reproduction. The genitalia of the specimen are figured *Trans. Ent. Soc. Lond.*, 1908, pl. xx., fig. 6.

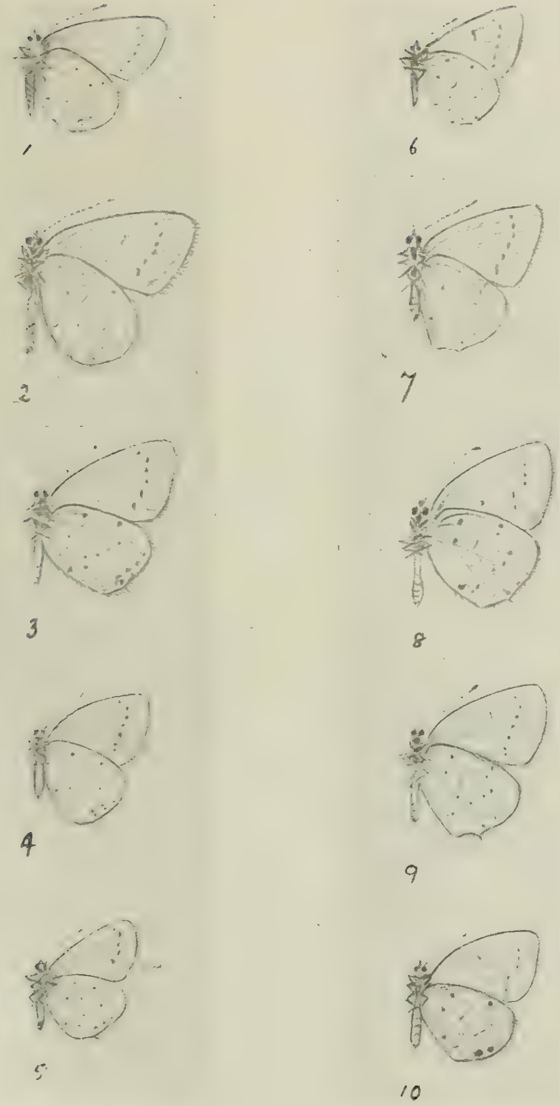
Fig. 8. E. alcetas ♂. Eperies. Typical.

,, 9. E. alcetas ♂. Eperies. Submedian line of spots on forewings almost as straight as in typical *E. argiades*; the nearest observed of many examples. The genitalia of this specimen figured in our pl. iii., fig. 4.

,, 10. Binghamia parrhasius ♂. Ceylon. The genitalia of this specimen figured in our pl. ii., fig. 4.

[To face Plate V.]

PLATE V.



Del. R. M. Prideaux.

UNDERSIDES OF CLOSELY-ALLIED EVERID RACES AND SPECIES—EVERES ARGIADES (1-5), E. VAR. COMYNTAS (6), E. VAR. AMYNTULA (7), E. ALCETAS (8-9), BINGHAMIA PARRHASIUS (10) (ALL ABOUT NATURAL SIZE).

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[*To face p.* 76.]

on the plants than he saw them laid, for their pale colour renders them conspicuous against the dark green of the plant, so that they are readily found. The butterfly lays several eggs one after the other, but all quite singly, and then goes off to feed for a little time. On one head of unripe pods of *Medicago lupulina* he saw two eggs, but not more than one on any flower-bud. The time of egglaying, he adds, does not appear to be restricted to any particular hour of the day, but usually takes place, as probably is the case with most butterflies, on the first bright morning after a dull or rainy day. Frohawk says that the eggs appear to be laid singly, usually at the base of the leaves of *Lotus*, although, in confinement, several were deposited in a cluster, and others singly, on various parts of the plant; eggs laid on July 24th, 1904 (♀ from South France), hatched July 30th, thus remaining only six days in the egg state. Sheldon observed a ♀ flying over *Erica*, apparently ovipositing, although this plant is not recorded as a foodplant, but he quite failed to find ova. Rehfous observes that, at Glanon-sur-Saône, the eggs are laid singly on the flower-heads of *Trifolium pratense*, thus supporting Zeller's observation that, in nature, the flower-head is the part selected. Edwards observed (*Can. Ent.*, viii., p. 202) a ♀ (*comyntas*) laying eggs upon *Desmodium marylandicum*, and, on July 9th, 1876, the ♀ being enclosed over a stem of the plant, several eggs were laid on the tender terminal leaves; another ♀, enclosed over *Trifolium*, red clover, on July 13th, deposited eggs on the young leaves and flowerets. Scudder notes (*Butts. New Engl.*, ii., p. 915) that a ♀ *comyntas* alighted on a stalk of *Desmodium* that he was holding in his hand and laid an egg on one of the green buds beyond the blue flowers, tucking it into the crevice between two adjoining seed-vessels; other ♀s enclosed over *Lespedeza* laid eggs high up on the stems, sometimes, but rarely, on the upper surface of the leaves, sometimes on the stalk itself, but generally either on one side of the base of the leaf-stalks or tucked in between the flower-buds, in some crevice or in the axils of the leaves. The eggs hatch in from 3½ to 4 days. Aaron states (*Can. Ent.*, ix., p. 200) that the eggs are laid in Tennessee on "ragweed" (probably *Desmodium*) in preference to white clover (*Trifolium*).

Ovum.—The egg is of the usual Lycænid shape, nearly circular, very flat, with many tubercles, and depressed in the centre; in the middle of this depression is a navel-like elevation, on which lies a green spot. When laid, the egg is very pale green in colour, but soon becomes light greenish-white, and lastly almost white; the oval stage lasting, at Glogau, from 8-9 days (Zeller). The egg is about ·446mm. in diameter, and ·223mm. in height (about the same size as that of *C. minima*, but resembling that of *Polyommatus icarus* in shape). Circular in outline, compressed, of a clear, pale greenish-blue colour, but varying both in extent of ground colour and in structure of reticulations, which are white, resembling frosted glass, and cover the whole surface in an irregular network pattern; in some, the pattern is almost like ordinary network, forming squares, others have the cells triangular, but all are irregular, and some have the juncture of the reticulations much more prominent than others. The upper surface is very slightly sunken, being almost flat, with a somewhat irregularly formed micropyle, which is darker and without the frosted appearance which covers the whole of the surface excepting the base; the reticulations on the depressed portion of the crown are simple, being without raised knobs at the junctures; those surrounding the side are prominent but diminished on nearing base; the cells between the reticulations have a fine granular surface (Frohawk). Described from photographs in several positions × 20, the width is found to be 0·42mm., the height 0·2mm. The sides are very upright, making the width of top or base comparatively little less than the maximum width at the equator. The arrangement of the cells of the white surface coat is largely "engine-turned," and, hence, many of them are quadrangular; they are about 0·03mm. in diameter at the margin and sides, but smaller towards the middle of the top, ceasing at the margin of the micropylar depression, which is about 0·07mm. across, and a little sunk, owing to the want of the adventitious coat, but apparently with network of cells somewhat continuous. At the angles of the cells are low eminences rather than knobs or pillars; they hardly exist on top except at the margins. On emerging the young larva eats out a good section of the upper surface (Chapman). [See also Scudder (*anteà*, p. 72).] Edwards describes the egg of *comyntas*, *Can. Ent.*, viii., p. 203.

Habits of larva.—The habits of the summer-feeding larvæ have been described by Frohawk, who states that the young larva (hatched July 30th, 1904) makes its exit by eating the micropylar area as well as a portion of the side of the eggshell. The larvæ are very active when first hatched, crawling rapidly for such small creatures and feeding on various parts of the plant; one was found half buried in the end of a stem which had been cut off; they also feed greedily on the seeds of *Medicago lupulina*, eating through the capsule and devouring the contents, and appearing to feed mostly at night; later, after the third moult, they appear to feed as much by day as by night, but are much slower between the moulting—the first moult occurring on August 3rd, the larvæ four days old, the second August 7th, the third August 12th, whilst the fourth and last did not take place till August 23rd. One larva, in its last stage, completely ate up the whole of the petals of a red clover blossom in two days; it appeared to be feeding continually, day and night, the whole time. During the earlier stages the larvæ are distinctly cannibalistic. One larva, after its first moult, was observed feeding on another,* but cannibalism was not noticed in the last two stages. These larvæ all pupated in due course, and produced imagines in September (Frohawk). The habits of the larvæ were described in much greater detail by Zeller, who observes that the newly-hatched larvæ, in confinement, ate the upper cuticle and parenchyma of the young leaves of *Medicago falcata* and *Lotus corniculatus*, leaving the lower cuticle untouched, rarely eating through the thickness of the leaf, the spaces thus eaten being small and several occurring on one leaf; after the second moult, which occurred in from four to five days (? after the first), the little larvæ readily took to the leaves of *Trifolium repens*, which they also ate from the upperside and somewhat skeletonised, one caterpillar resting peace-

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* Frohawk's details of this (*Ent.*, xxxvii., p. 245 *et seq.*) must be taken with caution. On p. 246, he states that "all the eggs hatched on the same day, July 30th, 1904," and that "the first moult took place on August 3rd." On p. 248 he stated that he "noticed one larva, after the first moult, feeding on a newly-hatched larva, which it seized as it emerged from the egg," which is very wonderful, if both statements be carefully studied together.

ably by the side of a larva of *Colias hyale* of the same size, on the same leaf; as the larvæ grew, they showed a great liking for the flower-buds, between which they lived, partly demolishing the young leaves, and skeletonising the larger ones. The third and fourth moults each take place after five to six days, the larva becoming rapidly larger, and eating now only the flowers and fruit; the young fruit it demolishes entirely, boring holes in the older pods, and eating out the seeds; its instinct in selecting the places where the seeds are, is remarkable; it selects exactly the spot in the hard *Lotus* pod, beneath which is the seed, boring where a slight swelling on the surface of the pod betrays the presence of the seeds; here it usually makes a hole at the suture through which it can thrust its head, and that only, the body remaining outside; it fastens itself so closely with the anterior of the prothorax, that it almost appears as if the larva adheres by suction, and, even when fullgrown, it is difficult to discover on the green leaves, or among the flowers, and Zeller says that he always had to search a long time before he could find them on the flowers in his breeding-pots. The mode of crawling is slow and snail-like. At the end of August, most of the larvæ ceased to feed, and were now dirty-reddish, although slightly greenish on the anterior segments, with very faded, broken, oblique, whitish, lateral stripes; they crawled about restlessly until they discovered a withered leaf, which suited them, and into which they crept. For some years the larvæ were thus brought to hybernation, but failed to live over the winter, except one which lived on until April, but then failed to pupate. In 1847, however, Zeller was more successful. He states that, on this occasion, he placed the eggs on some flowering shoots of *Medicago falcata*, standing in a glass of water, but, when the larvæ were halfgrown, he shook them off, placing them on a piece of turf in a flower-pot, on which lay some young pea-pods which were purposely opened some way along the suture. The larvæ either bored into these through the shell, or they made use of the opening as an entrance to the unripe peas. These offered them so rich and welcome a nourishment, as they certainly never find in nature; therefore, if the large summer form of *amyntas* could have been produced from the larvæ, the food-condition was here. The larvæ scarcely came out of the pods again; some rested with nearly the whole body in the peas; their excrement lost its usual consistence, and became very abundant, almost fluid and pale green, so that he despaired of rearing the larvæ. However, they became fullfed at the end of August, took on the brownish-red coloration of the hybernating form, and crept into the nooks and angles of some crumpled paper placed for them to winter in, and there remained. Zeller covered the pot with gauze, placed it in the window, and here the larvæ remained all the winter, where they had to withstand at least 15° of cold. In the spring, some of the larvæ had died, the rest, however, were in good health, and still rested on the few white threads that they had spun as a hybernating-mat, a few stronger threads being placed perpendicularly before and behind them. At the beginning of April they became active, and crawled out of the paper, and at once prepared for pupation. Laplace states that, at Hamburg, the larva hybernates from August to May, whilst, in Silesia, Wocke notes it as leaving its hybernaculum in April. Pabst observes that, at Chemnitz, the larva prefers to sit on the capsules of *Lotus corniculatus*, when feeding, and hybernates nearly fullgrown. Aigner-Abafi notes (*Illus. Zeits. für Ent.*, iii., p. 328) that he "found the larvæ of *E. argiades*, which otherwise only lives in the Buda-Pest district on *Lotus corniculatus* or species of *Medicago* and *Trifolium*, in the year 1897, in the pods of *Colutea arborescens*, whilst searching for the larvæ of *Lycaena iolas*, the pupa producing in due course a normal imago. At the same time were also found, in the same pods, larvæ of *Cupido minimus*, until then only known on *Coronilla varia* and *Melilotus*." Harris states that in America the larva of the *comyntas* form lives solitarily in the heads of *Lespedeza*; Scudder confirms this, and adds that the larvæ prefer the heads even when the latter are mature, and have little succulence. Edwards reared (*Can. Ent.*, viii., pp. 202 *et seq.*) larvæ on *Desmodium* and clover (*Trifolium*), but only one matured on the former and ten on the latter. On the *Desmodium*, the eggs hatched July 12th (laid on the 9th); on the 15th, one larva passed its first moult; on the 18th, the second moult; on the 21st, the third moult; on or about the 26th, the fourth moult, pupating on July 31st (the imago emerging on August 9th). The larva reared was green in all its stages, and the pupa green, but the larvæ on clover were red or reddish throughout, and the pupæ were dirty-white. The larvæ at first were such minute objects, as to be almost invisible, particularly on *Desmodium*, as both larva and plant were nearly of the same shade of green; on the clover they escaped sight among the flowerets; on the latter, the tender leaves were also eaten by the very young larvæ, a single larva eating out two or three furrows the width of its body, and side by side; as they became larger they seemed to feed on the calyces of the flowerets exclusively, curving themselves into the surface of the clover-head, or burrowing into it. On *Desmodium*, as there were no flowers in bloom, only the tender leaves and immature flower-buds were eaten. Scudder says (*Butts. New England*, ii., p. 908) that he was informed by Riley that, in California, the larva of *amyntula* lives within the pod of *Astragalus leucopsis*, frequently with a Noctuid larva, and a Curculionid larva, feeding normally upon the young and tender seeds, but also showing quite a carnivorous propensity, and eating its associates when not too active or too large. It leaves the pod to pupate.

Ontogeny of larva.—*First instar:* Pale brownish-red, differing in intensity, with a dark dorsal vessel, and a rather thick pubescence, three very faint, whitish, longitudinal lines, are visible with a lens on either side. *Third instar*[*]*:* About 2½‴ long, paler, greenish in colour with more or less reddish; the greenish red-brown dorsal vessel, is edged with whitish, and expands greatly on the anterior segments, but is not visible on the prothorax; on either side of the body run two wavy, faint, whitish, longitudinal lines, below which the ground colour is reddish, but varying in intensity, as far as the lowest (third) whitish, longitudinal line; one larva showed no red tint. *Fourth instar:* Paler in colour. *Fifth instar* (fullgrown larva): Head black; labrum and antennæ white; 5‴-6‴ long; pale green, with a dark green dorsal line wider at the extremities (dorsal vessel); flanges with a reddish

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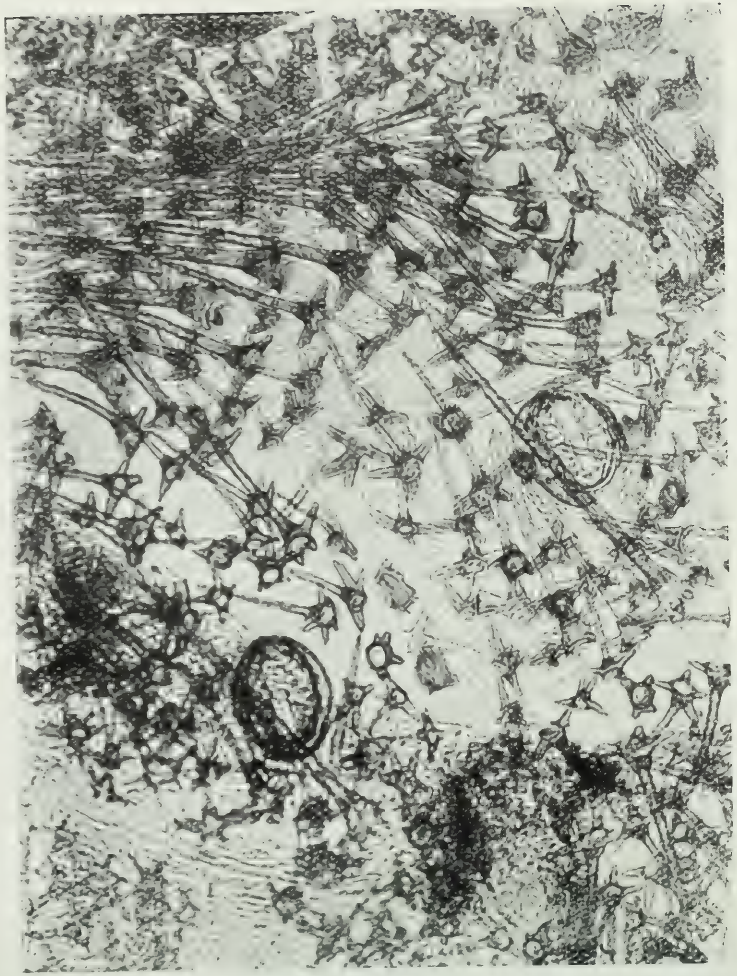
[*] Zeller gives no account of the second instar; his first description is up to the first moult, his second after the second moult, *i.e.*, third instar.

border on the middle segments; ground colour pale green; above the flange, two faint, dark, wavy, longitudinal lines; sometimes very faint, pale, lateral stripes are exhibited, which slope from above backwards; the dorsal vessel is dark green; on this, as well as on the hinder margins of the segments, on the longitudinal lines, and above and beneath the flange, there are thickly-set, brown, raised dots; the remaining portions of the segments carry whitish dots; some of these also lie between the brown ones, and all carry short hairs; on each side of the dorsal vessel is a row of somewhat larger bristles; the flange is only distinctly whitish, with reddish-brown border on the six middle segments. The chief colour aberrations are: (*a*) The flange quite without any white or reddish colour. (*b*) The dorsal vessel dark, brownish-red; the whole flange somewhat paler; the rest of the body greenish, with a reddish tinge. *Hybernating* (*fullgrown*) *larva:* Dirty reddish, faintly greenish on the anterior segments, with very faint, oblique, whitish, broken lateral stripes (Zeller). North American form (*comyntas*). *Young larva:* length ·05 inch; shape rather cylindrical; colour yellowish, excepting a few white tuberculated points on dorsum, arranged in two longitudinal rows; a similar row at base of body; from each of all these points arises a long, curved, white hair; head nearly as broad as second segment, black, shining, retractile. *After first moult:* length ·08 inch; onisciform, flattened, the dorsum flat at top, sloping towards base of body; colour greenish; the whole surface irregularly dotted with black; and from most, but not all, of the dots come white hairs, those on dorsum curved back, those nearer base curved partly downward and partly back; head obovate, long and narrow, smaller in proportion to 2nd segment than at last stage, and partly concealed, even when active, in 2nd segment; colour black. *After second moult:* length ·12 inch; broader and flatter than before; on each side of the narrow dorsal ridge a slightly raised edge, caused by the tubercles; at the base of the body a fold, and the hairs from this and the ridge are longer than elsewhere; whole surface finely pilose; colour green, but with a rusty tint caused by the numerous reddish points; above the fold these take the form of a line or slight stripe; at this stage the division of the segments becomes distinctly apparent. *After third moult:* length ·20 inch; colour clear apple-green, the crests of the dorsal ridge, and also the fold at base, whitish; on either side of the white line thus caused at the fold, on several of the segments after the middle, but not on the two last, is a reddish line; there is also an indistinct double oblique line of pale green on side of each segment; head as at last stage. *After fourth moult:* length ·36 inch, greatest breadth ·10 inch; onisciform, high anteriorly, the back rounded and sloping to last segment, which is much flattened; both ends (when the head is retracted) rounded equally, or nearly so; each segment rounded dorsally; the whole upper surface covered with fine white hairs; colour emerald-green, with very many yellow tuberculous points; along middle of dorsum a deep green stripe in a depression; at base a whitish line edged with vinous on three or four segments after the middle; underside and legs pale green; head ·025 inch in breadth, longer than broad, obovate, shining black, seen through the 2nd segment when half protracted (Edwards, *Can. Ent.*, viii., p. 203).

Larva.—*First instar* (July 30th, 1904): When newly-emerged, the larva is exceedingly small, being only ·625mm. in length; it is similar to other young Lycænid larvæ in having a slight mediodorsal furrow, and sloping sides, and is furnished with rows of long, white, serrated hairs, four dorsal and three lateral, on each segment; those on the dorsal surface (i and ii) are in pairs on each side of the furrow, both curve backwards, the anterior one being very long; below these are two spiracle-like discs, outlined with dark olive, and below, a pair of small dark tubercles having a cup-shaped hair (iii), excepting on the 3rd, 4th, and 5th abdominals, which only have hairs on the posterior ones; the subspiracular row of hairs (iv and v) consist of three long ones on each segment, projecting laterally, each having a dark base; along the ventral edge are similar serrated hairs (vii), and shorter ones on the prolegs. The head is greenish-olive and black; the body of a pale ochreous in shadow, and pale grey in high light; to the naked eye it appears wholly whitish; the entire skin-surface sprinkled with black points; grew to 1·6mm. before first moult on August 3rd, the first stage lasting four days. *Second instar* (August 5th): About 2mm. long, the body considerably humped dorsally, from mesothorax to 6th abdominal, the prothorax and 7th, 8th, 9th, and 10th abdominals, being rather compressed; a decided lateral ridge; the surface finely granulated, studded all over with serrated hairs of various lengths; those along dorsal and lateral regions, longest and curved; all are whitish (excepting those on subdorsal surface, which are dusky) with bulbous bases, from which rise thorn-like spikes, each base forming a star; there are also numerous discs scattered over the body. The general colour pale yellow, with a mediodorsal longitudinal brownish stripe, oblique brownish lateral stripes, and a rust-coloured subspiracular line, bordered laterally with whitish; the head shining black, beset with a few fine white hairs. [Other forms occur having a generally pale greenish ground colour with slightly darker markings.] Second moult, August 7th. *Third instar* (August 8th): About 5mm. long; very similar to previous stage, but, on the 7th abdominal segment is a rudimentary gland, or one of indistinct formation, surrounded by minute star-like processes, and a fringe of delicate white spines or bristles, each bearing a tuft of spine-like hairs, extremely fine, similar in construction to those bordering the gland of the larva of *Lycaena arion*. [Both forms now closely resemble each other, the brownish marked form assuming a generally green colouring, with only a faint pinkish lateral line.] Third moult, August 12th. *Fourth instar* (August 12th): About 6·5mm. in length, the ground colour of a beautiful clear green, with a darker green mediodorsal furrow; three longitudinal rows of oblique dull green side markings, and a waved dull green lateral band, bordered below by a pale line and faint, dull, brownish-pink streaks; the whole surface is thickly sprinkled with serrated hairs of different lengths, those bordering the dorsal furrow being the longest; they vary from white to ochreous-brown, have similar swollen star-like bases, varying in form and colour—some brownish, others white, resembling little glass petals; as in previous stage, numerous discs are scattered over the surface; the spiracles prominent, outlined with brown; the gland on the 7th abdominal is now more distinct, but surrounded with similar processes and bristles. Fourth and last moult, August 23rd. *Fifth (final) instar:* When fullgrown measures 10mm. in length; of the usual onisciform shape,



1. Spiracles, hairs, and hair bases of the 7th and 8th abdominal segments of larva of Everes argiades (left side) ×150.

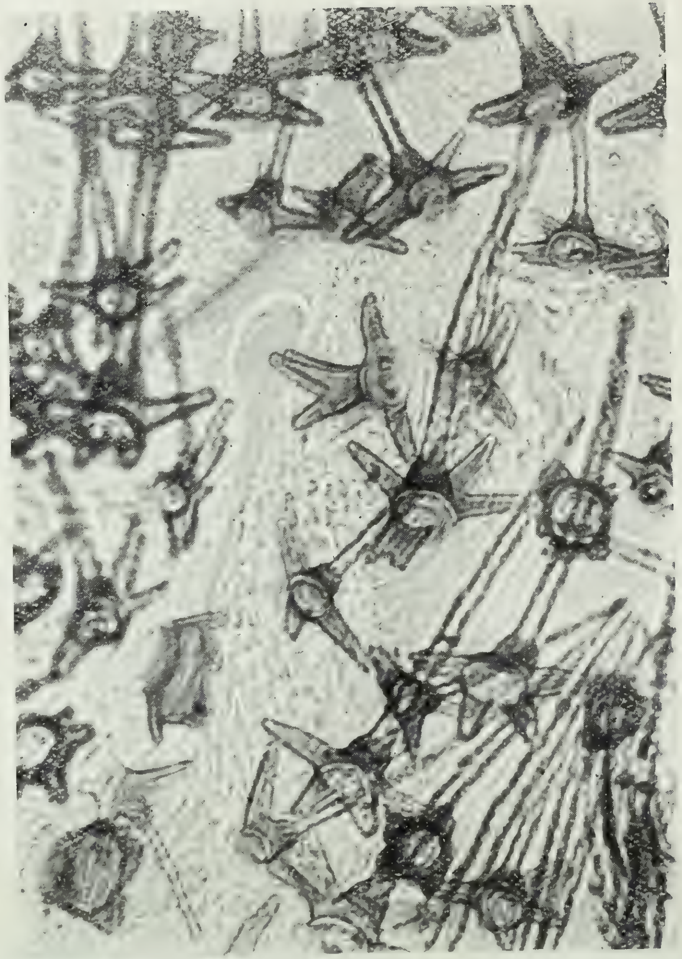


Photo. F. N. Clark.

2. Skin-structure of larva of Everes argiades in last instar, behind and below spiracle of 7th abdominal segment × 350. (Compare Fig. 1 on this plate.)

Larval structure of Everes argiades.

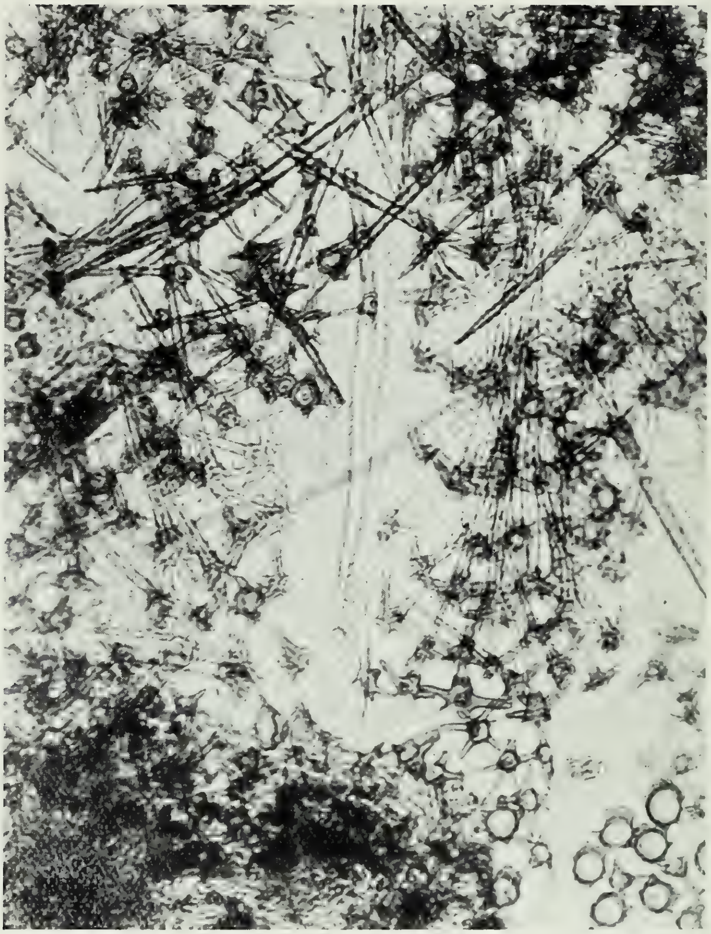


Photo. F. N. Clark.

PORTION OF 6TH, 7TH AND 8TH ABDOMINAL SEGMENTS OF LARVA OF EVERES ARGIADES, JUST ABOVE SPIRACLES OF RIGHT SIDE (LAST INSTAR); SHOWING SPIRACULAR LENTICLES OF 6TH ABDOMINAL SEGMENT (IN CORNER) × 150.

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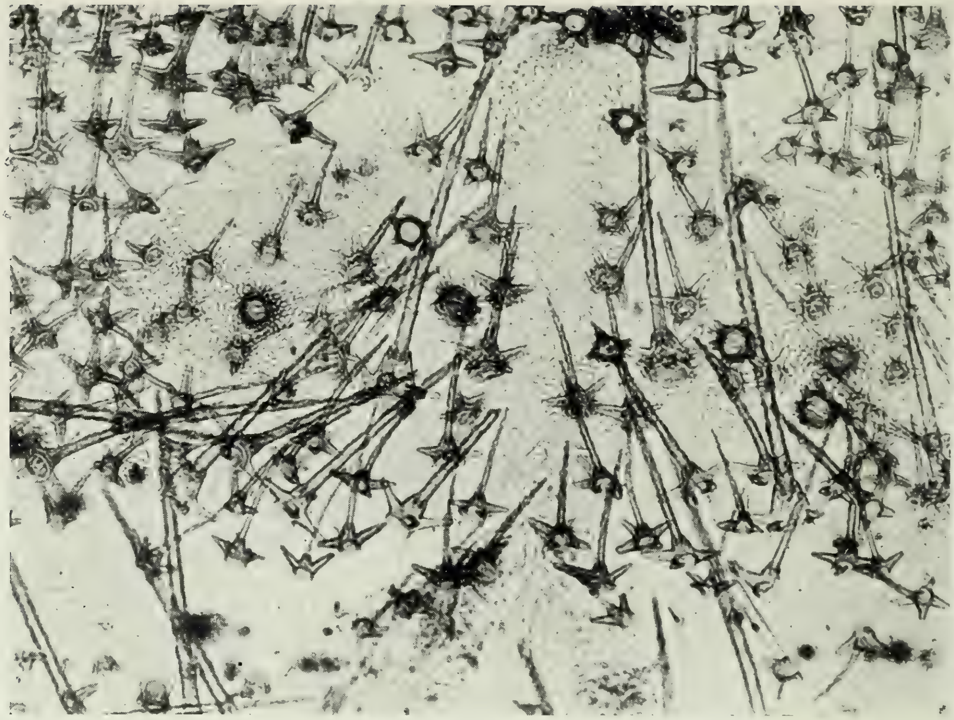
[*To face p.* 83.]



1. PROTHORACIC PLATE OF LARVA OF EVERES ARGIADES, LAST INSTAR, SHOWING BASES OF SPECIAL PROTHORACIC HAIRS × 150.

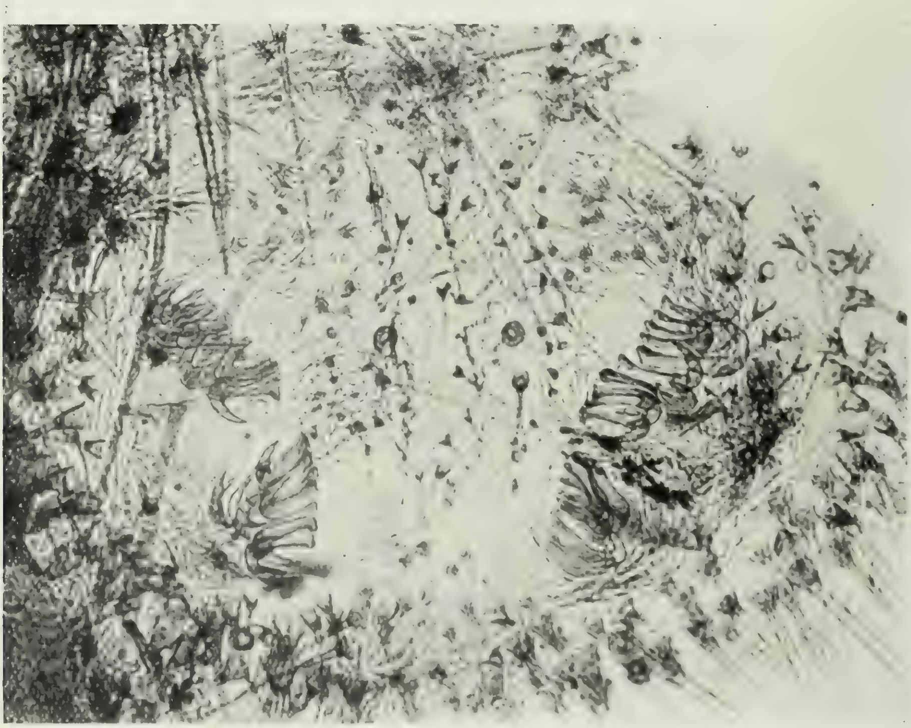


Photo. F. N. Clark.

2. ANAL CLASPERS OF LARVA OF EVERES ARGIADES, LAST INSTAR × 150.

LARVAL STRUCTURE OF EVERES ARGIADES.

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with slightly flattened sides; a very shallow dorsal furrow, bordered on each side by a fringe of spinous bristles, slightly serrated and varying in length; the whole surface densely studded with shorter, but similarly-formed, bristles, varying in length, and in colour from white to pale brown; each, including the longest dorsal ones, having wonderfully formed bases, similar to but more pronounced than those in the previous stages, composed of a bulb-centred star, the points rising from the base; some are wholly white, others olive-green; there are also numerous shining whitish-green discs, outlined, or set in black rings more or less starred, of various sizes, and scattered over the whole surface; the spiracles are whitish, outlined with brown, and the inner edge dentated; the gland on the 7th abdominal is similar to that in the previous stage, being a small elongated transverse fissure, and fringed with fine white bristles, as described; although so similar in formation to the gland of *Lycaena arion*, no fluid has yet been detected issuing therefrom, it also appears to be less sensitive to irritation. On the 8th abdominal is a subdorsal, partly retractile, whitish tubercle. The ground colour is pale green, with a darker green mediodorsal stripe, and oblique side stripes of a fainter green; in some individuals the lateral ridge is tinged below with pinkish-brown. Head black and shining, hidden under the overlapping prothorax, except when extruded while feeding and crawling (Frohawk). *Final instar:* The green larva has a darker (reddish) lateral line, and is well clothed with hairs; these are longer dorsally (on the dorsal flanges or ridges) 0.2mm., and laterally (lateral flange) 0·3mm., and a few 0·4mm. long, finely spiculated, very slightly curved, and tapering fairly regularly; their bases are nearly twice as high as broad, and possess 3 to 6—usually 4 or 5—lateral processes, with star-like effect; these processes are conical, sometimes a little blunt, and about as long as the thickness of the base (0·01mm. to 0·02mm.). The hairs and bases vary less than is usual, chiefly in size. There are also many lenticles, like hair-bases, with wide open tops, and shorter and more numerous (usually 5 or 6) star-like processes, and, perhaps, less high than the hair-bases; these are generally scattered, but more numerous along the incisions and near the spiracles. The honey-gland* has a tolerably continuous row of them round its margin. The fan on the 8th abdominal segment (when retracted) is a bare circle, surrounded by a few rather longer hairs. The black head is large (0·8mm. across). The prothoracic plate is of diamond-shape, long diameter 0·4mm., transverse, 0.6mm.; its hairs and lenticles seem much like those of the rest of the surface, except that, towards each angle, there is the rather large, dark, circular base, and the curious hair special to this situation. The spiracles are large, only slightly oval (0·07mm. to 0·08mm.) There is the usual long extensile "neck," longer than head. This neck is required not only for the protrusion of the head in burrowing into pods, buds, etc., but also for the extreme retraction of the head into the prothorax. The true legs are dark, rather long and stout (0·4mm. long), tapering so as to give rather an oval than conical outline. Each pad of the prolegs (two to each as usual) possesses eight to ten very pale, rather long, slender hooks

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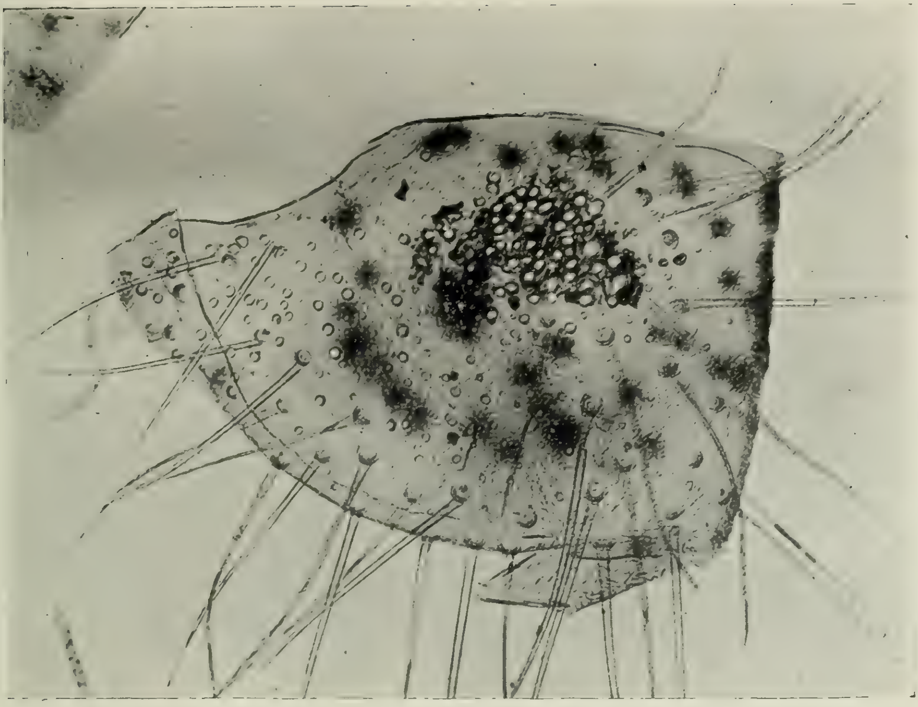
* Although the honey-gland is noted both by Frohawk and Chapman, we believe that the actual association of the larva with ants has not yet been chronicled.

(0·02mm. long), with a completely recurved, *i.e.*, pointing basally, hooked termination. The general skin-surface is minutely spiculated with transparent points (Chapman).

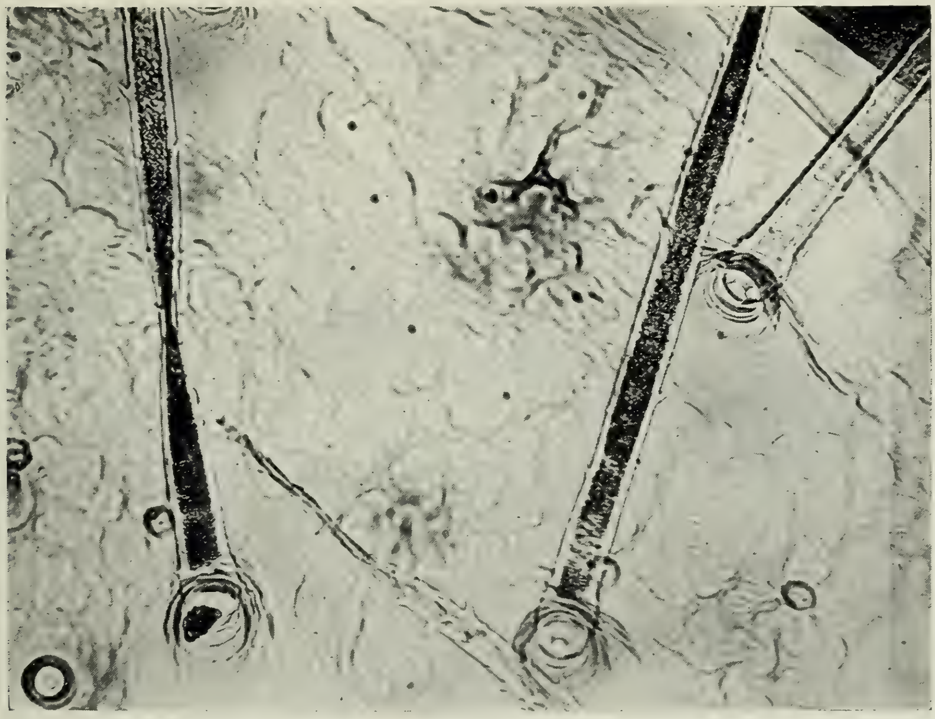
Foodplants.—*Medicago lupulina*, *M. falcata*, *Trifolium pratense*, *T. arvense*, *T. repens*, *Anthyllis vulneraria*, *Pisum sativa* (Zeller); *Coronilla varia* (Rössler); *Genista* (Lambillion); *Lotus corniculatus*, leaves, seeds, and flowers of common white and red clover (Frohawk); *Colutea arborescens* (Aigner-Abafi); *Onobrychis sativa* (de Sélys-Longchamps); *Cylista scariosa* (in India) (Bell); [*Rhamnus frangula* (de Sélys-Longchamps) wants confirmation]. [For foodplants of the American forms see *anteà* p. 73.]

Pupation.—The pupa is supported by a cremaster, and by a girth that crosses in front of the 1st abdominal segment (Chapman). The hybernating larvæ become active in the beginning of April; on leaving their hybernacula, a dried curled-up elder-leaf appeared so eminently suitable for pupation that five larvæ crawled inside it, and pupated there, whilst only one spun up on the paper. The larvæ spun a silken floor and, on April 11th, the two earliest had become pupæ, the rest following in a few days. They are fixed at the anal extremity and have a girth round the middle of the body to the silken resting-place. The pupal period of the spring chrysalids lasts about twelve days (Zeller). The fullfed larva of the August brood spins a silken pad over a leaf, and attaches itself thereto by the anal hooks and by a silken girth round the body, and thus pupates. The usual position is in the centre of a leaf, and the general resemblance, both in form and colour, between a decaying *Lotus* leaf and the pupa, is very similar. The pupal stage lasts from ten to fourteen days, according to temperature (Frohawk). Edwards notes (*Can. Ent.*, viii., p. 203) that, when about to pupate, the larva of *comyntas* remains motionless for several hours, usually on the upper surface of a leaf, the green shade becoming gradually yellowish, then red rusty-brown, and a loop is thrown over the body almost mid-length. When the change has occurred, the shape and appearance of the green chrysalis are so like those of the larva as to require some inspection to discover whether it is a chrysalis or no, lying flat on the leaf, the upperside rounded and of almost exactly the larval shape; to make the resemblance still closer, the chrysalis is as hairy as the larva. Scudder observes (*Butts. New Engl.*, ii., p. 916) that, on August 5th, a fullfed larva took up a definite position on the upper surface of a leaf; the next day it was less visible, and was observed to have woven two overhanging leaves with a web of silk, so as entirely to conceal it from view above; on the morning of August 27th, it had spun a loose band across its body, and, noticing that the overhanging leaves seemed now still a little nearer, it was discovered that the tip of one was attached by a few very slight long threads, at considerable distance from each other, to the leaf on which it rested; the head of the larva is completely concealed whilst it is resting for pupation to take place. Abbot observes that the pupal period of the summer insects, in Georgia, lasts from June 6th-24th.

Pupa.—The pupa is greyish-ochreous, sprinkled all over with black, or rather blackish-grey, dots, less than 0·1mm. in diameter, which tend to accumulate into a dark dorsal line, whilst, again, there is a black spot above the spiracle. Each extremity of the 1st abdominal segment has a conspicuous black mark. What strikes one most, however, about the pupa, is its clothing of long hairs, about 0·6mm. to 0·7mm. in length, finely spiculated, about thirteen on each side of an abdominal segment down to the spiracle. The length of the pupa is 8mm.; the ventral line straight; the dorsal rising to 2·5mm. on the mesothorax and 3·0mm. over abdomen (at the 3rd abdominal segment), at 2·5mm. and 4·5mm. from the front respectively; the width, at the thorax 2·2mm., at the 3rd abdominal segment 2·6mm. The hairs on the prothorax form a sort of curtain over the head; on the mesothorax there is a dorsal set and two small groups below, almost as of warts; along the abdomen and round the posterior extremity, the hairs spread down to the surface of attachment like a curtain. Examined in detail, the most striking peculiarity is still the length of the hairs (rather than their number), in which this species agrees with its ally, *Cupido minimus*, and with no other Lycænid pupa examined so far. Perhaps the next most striking feature, in which it agrees with many other Lycænid pupæ, is the sprinkling of dark spots all over it, and the greater darkness, in these, of the ribs of the fine network, so that in them it is very distinct, but, elsewhere, almost requires looking for. These black dots are very uniform in size and very equally distributed, being seldom smaller than 0·05mm. or larger than 0·075mm. in size, and are not, as a rule, run together into lines or blotches; there are a few larger black markings. The hairs are also very uniform, being from about 0·5mm. to 0·75mm. long, slender, and, except close to the base, armed throughout with fine spicules. The head, with face-piece, 1·6mm. long, is narrow between the antennæ (0.5mm.), but 1·6mm. wide ventrally, against the appendages, and forms, indeed, a triangle with the angles truncated and the margins hollowed. The labrum is a sharp triangular flap about 0·25mm. across the base, but with an extension backwards, so as to form a square, and with lateral lines going straight backwards. What these quasi-sutures represent as a basal segment of the labrum, is obscure. The mandibles nearly meet in the middle line for a distance below the apex of the labrum of about 0·22mm., but are not marked off by any basal suture; between them is a space, possibly the labium. The maxillæ are not, however, separated, and the apex of this *labium*, if it be so, passes beneath them. The glazed-eye is a smooth arch, about 0·7mm. long and about 0·1mm. wide, and presenting no distinct structure; the rough area within it is wrinkled like the rest of the surface, has two black spots and one hair. The face is less spotted than the rest of the surface, the vertex is about normal, and has about 25 spots, 14 hairs, and some half-dozen lenticles near its centre. The maxillæ are about 3mm. long to where they disappear beneath the antennæ; together they are about 0·4mm. across at the base, rapidly narrowing to 0·25mm.; they are spotted, but very faintly sculptured. The antennæ, 6·6mm. long, pass down to the end of the wings and are weakly sculptured. The first legs, barely 2mm. long, are wide against the face and eyepiece (0·5mm.), and narrow rapidly to a point; they are against the antennæ for about 0·4mm. The second legs are just over 2mm. long, pointed at both ends and, being lower at top, extend lower than the first legs into the angle between the maxillæ and antennæ. Three lenticles are found on one of the first legs, five on the opposite (at tibio-tarsal articulation ?); on the second legs, none on one side, one on the other. The surface-sculpture is evident in spots, hardly to be detected elsewhere. The dorsal head-piece (of one side) is a little slip left attached to the front margin of the prothorax, 0·6mm. wide transversely, 0·05mm. at middle line, where it meets its fellow, and 0.15mm. towards the outer end, where it ends by rapidly narrowing to a point; it is markedly sculptured, but has no dots, hairs or lenticles. The prothoracic piece of either side is about 1mm. long at dorsal line, preserves this length for two-thirds of its width, then narrows to a point, the width being 1·5mm.; the anterior margin is convex, the posterior concave; at its exterior half, where it is opposite the spiracle-cover, it possesses many black dots, some 30 to 35 hairs, somewhat more closely placed along the anterior border, and a very great number of lenticles, sparse along the dorsal margin, but, in centre of piece, massed into a close phalanx of about 80, to the exclusion of anything else, over an area of nearly 0·5mm. across; each lenticle is from 0·03mm. to 0·04mm. across; the dorsal line (suture) is dark, and then a dark spot, larger than usual, just outside the group of lenticles. The mesothorax has a dorsal margin of about 2·5mm., and a front margin of about 1·7mm., hollowed out behind for the metathorax, so that it is only about 1·4mm. long, just above the wing-base; the cover of the first spiracle begins 1mm. from dorsum, and is a long, narrow, oval of about 0·3mm. along the margin of the segment; it has the usual structure of a mass of nail-like, or mushroom-like, hairs, more or less soldered together. It is to be noted that, in all these Lycænid (and all other ?) pupæ, the actual spiracle in the empty case remains attached to the mesothorax, and has nothing to do with the prothorax. This was one among many other circumstances that made me assert, many years ago, that the first spiracle, though apparently in the prothorax in the larva, really belongs to the mesothorax. The mesothorax carries (on each side) some 30 hairs, comparatively few lenticles, and a good distribution of black spots, three or four touching each other more often than elsewhere; the wings are not quite so abundantly spotted, and the netting is quite marked; there is a large black spot at the base of the wing (site of wing-spine ?); "Poulton's line" marks off a very narrow margin. The metathoracic piece (of one side) is of the usual curious shape, about 0·2mm. long at the dorsum, 1·0mm. at the recess in the mesothorax, 1.3mm. wide, or 1·6mm. along its sloping anterior margin; towards its outer front margin it has a group of five hairs and eight or nine lenticles, another dorsal hair, a large black dot towards its outer front margin; elsewhere it is spotted and sculptured as usual; it has the usual backward extension at its outer margin, ending in the hindwing, a faint margin of which extends to the anal angle of the front wing. The 1st abdominal segment is 2mm. across and about 0·3mm. long; it has two hairs that might be called the setæ of tubercle ii, and several lenticles; its sculpturing is rather faint, except in what is the feature of the segment, and, as regards colouring, of the pupa as a whole, *viz.*, a large black spot occupying the whole width of each end of the segment; just inside this, and also at the wing-base on the metathorax, I note a curious little spiral hair, which I concluded, in another species, to be on the inner surface of the pupa, and to be something drawn out (like the tracheæ are) at moulting. The 2nd abdominal segment is 0·8mm. wide and 2·7mm. across; it has about a dozen hairs on either side and a good many lenticles, as well as a small cloud of about 50 to 60 anterodorsal to the spiracle.



1. PROTHORAX OF PUPA OF EVERES ARGIADES × 45.

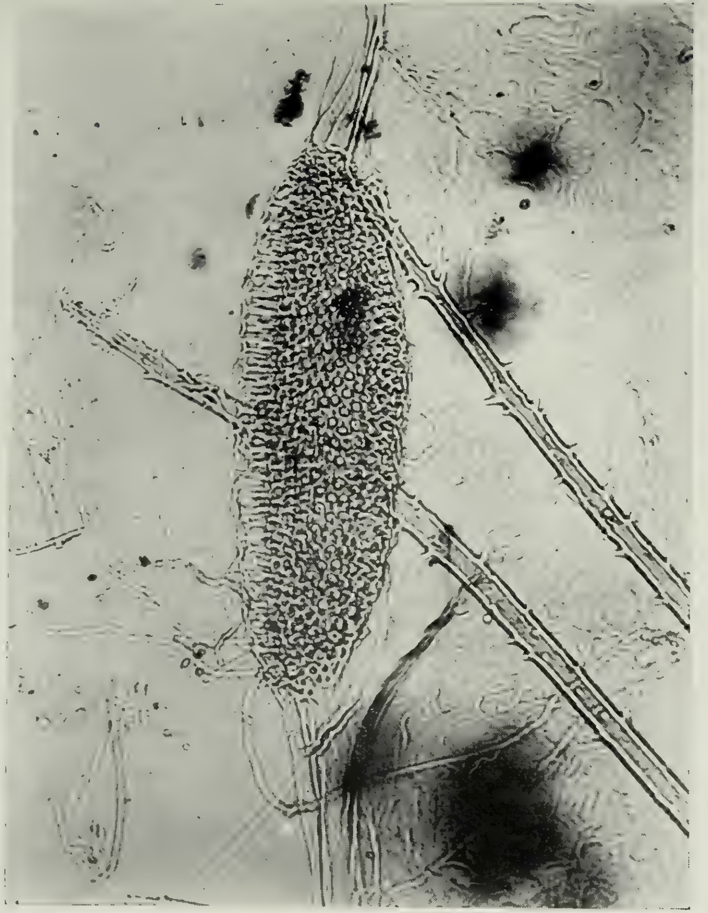


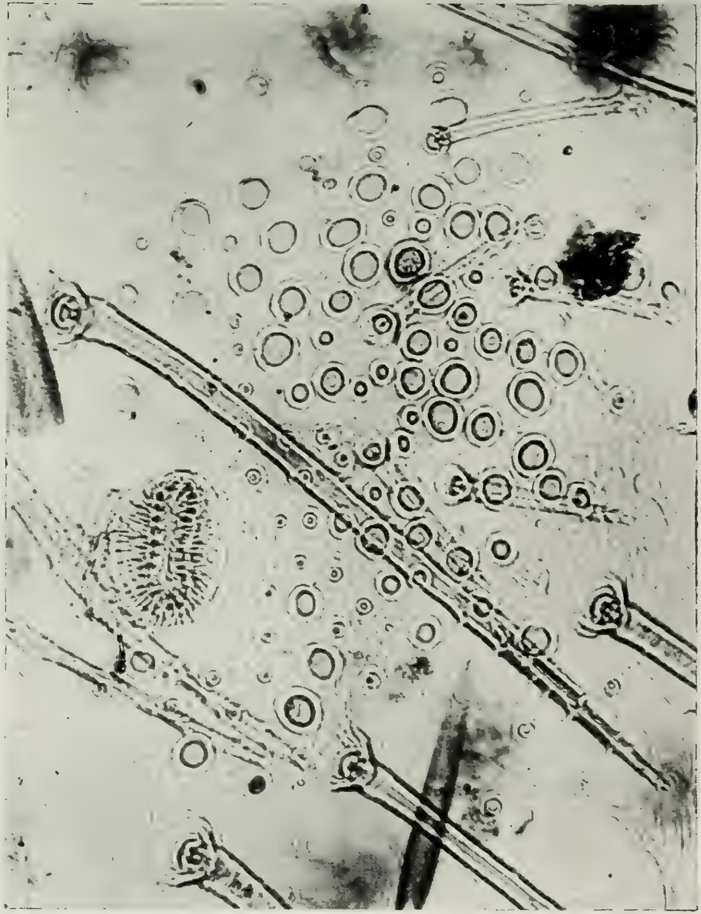
A Natural History of the British Butterflies, etc., 1909. *Photo. F. N. Clark.*

2. PUPAL HAIRS OF EVERES ARGIADES × 200.

PUPAL STRUCTURE OF EVERES ARGIADES.

To face p. 86.)





A Natural History of the British Butterflies, etc., 1909.

Photo. F. N. Clark.

1. Cover of prothoracic spiracle of Pupa × 170.

2. Spiracle of Pupa × 170.

(*To face p. 86.*)

Pupal Structure of Everes argiades.

The 3rd abdominal segment is nearly 1mm. wide and 3·2mm. across, the ends, of course, obliquely; it has 16 or 18 hairs on either side, and lenticles as in the 2nd abdominal segment. The 4th abdominal segment is about 0·7mm. wide dorsally, and extends (narrow ventrally) round the pupa. The 5th abdominal is about 0·7mm. dorsally, and is only about 0·2mm. ventrally, but of weak and collapsible tissue. The 6th abdominal is 0·7mm. dorsally, and 0·2mm. ventrally. The 7th, about the same dorsally, but almost evanescent ventrally; it has only nine or ten hairs on either side, but, like all the preceding segments, has the swarm of lenticles near the spiracle. The 8th abdominal segment is about 0.5mm. wide dorsally, hardly distinguishable ventrally; its obsolete spiracle has sixteen or eighteen lenticles as satellites, and there are eight or nine hairs on either side. The 9th abdominal has dorsally fourteen hairs, but for the rest is indistinguishable from the 10th abdominal segment by any definite sutures. All these segments, 3rd to 9th, are very similar in the spots and sculpturing. The somewhat circular area, consisting of the 9th and 10th abdominal segments, has, like other Lycænid pupæ, a transverse curved suture, nearer its ventral than dorsal margin, and a short one at each end of this, parallel, and close to the suture of the 8th and 9th abdominal segments, and a good way ventral of the obsolete spiracle. The cremastral hooks are arranged in a circular area, wanting, however, at the anterior (or ventral) margin; on the dorsal margin of the circle they divide the ordinary sculptured and hair-carrying surface of the 9th segment from the central area of the circle which has a transparent, colourless, membranous structure, studded, however, centrally, with minute skin-points, sharp, and directed forwards, a "forwards" that would be backwards, but for the great incurving of the dorsal surface. What is anterior anatomically is, here, posterior topographically. It is just possible to recognise that the hooks have an upper (posterior or dorsal) set, dorsal to the transverse suture, consisting of about 120 hooks, and two lateral patches below this suture, each of about 30 odd hooks. The hooks have short, thick, stems, somewhat curved, with anchor-ends set on a little sideways; their length is about 0·045mm., with a few longer up to twice this length. The spiracles are about 0·1mm. long, and 0·07mm. broad, rather larger on the posterior segment; the opening is a narrow slit, surrounded by a radiating grid, each ray of which is double, as if folded at the outer end. The sculpturing is apparently the same over the whole surface, but can often hardly be seen, except in the dark spots; it is a raised, interlacing set of ribs, sponge-like in their anastomosis, and with the appearance of passing behind each other; here and there their branches dwindle down into very fine skin-reticulation. The rosettes (about 0·01mm. across) of the reticulation are very flower-like (like a single rose), with a central spot and radiating lines dividing the outer portion into four or five petal-like pieces. These rosettes occur very distinctly in places where the network is almost invisible, always at crossing-places of the network, and, as usual, hairs and lenticles are never on the lines of network. The lenticles near the spiracles are 0·04mm. across, sometimes, perhaps, 0·05mm., and vary down to a third, or even a fourth of that diameter; their membrane is always beautifully dotted. The hairs have colourless and structureless walls, about a sixth of their diameter in thickness, and appear to be marked by a set of spiral lines, giving a very trachea-like appearance, the lines being at an angle of about 60° to the axis of the hair. The segments separate rather easily, and, in doing so, display a nearly structureless intersegmental membrane, except in the case of abdominal incision 4-5, where it is covered with fine points, almost spicules, showing that this incision is probably capable of a certain amount of movement in the living pupa. [Described from an empty pupa-skin.] (Chapman). About 8·5mm. long, of fairly uniform thickness; the head truncated in front, the thorax slightly swollen dorsally, the abdomen rises at the base and falls away in a gentle curve to the anal extremity, which is bluntly terminated. The entire surface is a pale green, and very finely reticulated; the wing-cases are rather whiter-green than the rest of the body, with whitish neuration, and irregularly sprinkled with minute black specks; a mediodorsal line composed of a series of black marks and specks, runs the entire length, and forms a well-defined line over the head and thorax, but becomes broken up into a series of spots on a darker ground stripe along the abdomen; a supra-spiracular series of small black dots, one on each of the 3rd, 4th, 5th, and 6th segments, and a large, somewhat oval black blotch on the 1st abdominal segment, and two others, one at the base of the wing on the mesothorax, another on the metathorax, also a small spot on the prothorax; all these, and a few other tiny specks, sparingly sprinkled over the body, are black. The whole surface, excepting the wings, sprinkled with slightly curved, moderately long, white, serrated hairs, each with a swollen base; a few fine white bristles near base of wings, terminating in a cluster of much finer bristles. The spiracles are whitish and prominent (Frohawk). The pupa is 4½ lines long, rather slender, yellowish-brown, dotted with brown, with a black-brown dorsal line, and a strong black-brown dot on each side of the 1st abdominal segment; thorax and abdomen with many pale yellow or whitish bristles, thickened at their bases. The strong spot-like point lies near the margin of the wing-cover, and the girth runs beside it. The succeeding segments also have a dot, but much smaller, and less conspicuous, and well above the spiracles. The wing-cases are without bristles; the brown dots are thick, and arranged in longitudinal stripes, which are separated by paler lines. The bristles of the thorax are whitish, the rest yellowish, longer, and somewhat curved. On both sides of the head, the bristles stand crowded together almost in tufts (Zeller).

Variation of pupa.—Edwards notes (*Can. Ent.*, viii., pp. 202 *et seq.*) a difference in the colour of pupæ of the form *comyntas* according to the foodplant of the larvæ. He says that a larva fed on *Desmodium* was green, and its pupa was green; whilst larvæ fed on clover were red and the pupæ sordid-white. He describes them as follows:—

(1) Length ·26in., greatest breadth ·10in.; shaped much like the mature larva, rounded at each end, tapering on the sides somewhat from segments 5 and 6 to head, roundly carinated dorsally, flattened on underside; the mesonotum but slightly prominent; colour emerald-green; a dark green medio-dorsal stripe from end to end, and on either side of this a row of small round black spots, nearly the whole length; much covered with fine white hairs; on the top and sides of the anterior segments the hairs are conspicuously longer, and are arranged in tufts, and similar hairs form a connected fringe quite round the abdomen.

(2) Sordid-white on the whole upper surface and lower side of abdomen, the former speckled with brown; the medio-dorsal stripe brown, as also the dots;

underside of thorax and of head-case, and the whole of the wing-cases, apple-green.

Time of appearance.—The species is double-brooded in its more northern, and triple- or quadruple-brooded in its more southern, European habitats. At Glogau, Zeller repeatedly obtained eggs in July and August, but the larvæ always hybernated when fullfed, pupating in the spring; on the contrary, eggs from ♀s taken near Biarritz on July 24th, and reared in England, produced, without exception, imagines between September 6th and 18th, 1904, none going over, thus suggesting an extra brood as between Silesia and southern France; at Guéthary, Sheldon noticed an assumed second-brood worn on July 14th, 1905, and a quite new brood fully out in the same place, August 8th-12th; this, no doubt, corresponds with the seeming third-brood that appears at Grésy-sur-Aix, in varying seasons between mid-August and the end of that month. Usually the spring examples are smaller than the summer brood, the autumn brood being a mixture in size of large and small examples. In Belgium it seems to be double-brooded, appearing somewhat earlier or later according to the season, the first-brood from the end of May and throughout June, the second-brood from August until the end of September (Lambillion), although Hennin notes its appearance in July at Virton and Denée. In the Netherlands it occurs in May and July (Snellen). In France it is rare in May and June, more abundant in July-August, *e.g.*, in the forest of Amboise (Lelièvre), Brenne (Martin), Nohant (Sand), in Brittany (Oberthür), Mont Dore (Sand), Allier (Peyerimhoff), Chavoire, Grésy-sur-Aix (Tutt), etc; the second-brood is very abundant in the Vosges Dept.—July 10th-August 2nd, 1908 (Gibbs). It is reported as triple-brooded in the Alpes-Maritimes (Bromilow), whilst Rondou notes it in the Pyrenees from June-September, and Goossens as occurring frequently in September, near Grenoble, and one suspects that it is at least partially triple-brooded in all the warmer parts of southern France. Chapman notes it as early as March, 1897, near Cannes. Many authorities give only July-August for central and northern France, but one suspects that the possibly rarer first-brood has been in these cases overlooked; whilst as far north as Côte-d'Or, evident third-brood examples were taken, September 3rd, 1905 (Rehfous); and Guenée notes that it is occasionally found at Châteaudun, in September and October. It has been noted as occurring in May in Corsica (Mann), and on July 13th, 1905, at Corte (Powell), apparently the only summer record, a very strange fact, as our collectors should have met the later broods. In Switzerland, it occurs in the Geneva district from the end of April-June, and then, almost continuously, from the end of July to early September (Blachier), the latter consisting possibly of a second- and a partial third-brood (Reverdin). Two broods are recorded from the Zürich district by Frey, and Lang mentions the August brood on Mt. Pilatus and at Meiringen, and one suspects the occurrence of at least a partial third-brood in all the warmer parts of Ticino. In Germany the species is suggestively partially triple-brooded in the Rhine Provinces, occurring in May and July and September (Stollwerck), but otherwise noted as double-brooded in East and West Prussia, end of April to beginning of June, then again mid-July to September (Speiser); in Pomerania, at the end of May and again in July (Hering); in May and July in Hamburg (Zimmermann); in Hanover, in April and May and again in July (Glitz); in Hesse, at Wiesbaden, in April and May and again in July (Rössler); in May and August at Hanau (Limpert and Röttelberg), in May and July and August at Frankfort-on-Main (Koch), but the spring brood only in June around Cassel, where it appears to be single-brooded (Borgmann); in Waldeck, throughout May, and again from the beginning of July till mid-August, whilst, in 1859, a fresh ♀ was found as late as September 10th (Speyer); in Thuringia, in May, and again in July and August (Krieghoff); in the province of Saxony in May and again in July and August (Wilde and Stange), May and July in Anhalt (Richter); in Brandenburg, in May and July and August, both at Finkenkrug (Pfützner), and Frankfort-on-Oder (Kretschmer); in Posen only recorded for May and June (Schultz); in Silesia, May to mid-June and again in July-August (Wocke); in the Kingdom of Saxony, in April and May and again in July and August (*Ent. Ver. Iris*); in Bavaria, at the end of April and May and again in July and August (Schmid); May at Lahr (Keynes), in Baden, in April and July-August (Meess and Spuler). In Austria the species occurs in two (or three) broods, *viz.*, mid-April to mid-May, mid-June to early-August, and mid-August to mid-September in Hungary (Aigner-Abafi); it is reported as double-brooded in Bohemia, in May and again in July and August, sometimes in September (Nickerl); in Moravia, at Brünn, April (27th) to May (16th), and July-August (Fritsch and Schneider); in Upper Austria in May and again in July-August (Brittinger); in Lower Austria from April-June, and July-September (Rossi); and in Salzburg in May and again in July and August (Richter). In Dalmatia it appears to be triple-brooded, occurring as late as mid-September at Pirano and Trieste (Mathew). In Bosnia and the Hercegovina, as also in Bulgaria and eastern Roumelia, the species is double-brooded, the spring examples of the well-known form *polysperchon* (Rebel), whilst in the lower Volga districts, it is only noted as occurring in May and June (Eversmann), but Kroulikowsky notes it as occurring in the Waitka Govt. in May as var. *polysperchon*, and in July as *argiades* [and *coretas* (very rarely)]. In Italy very little is recorded of the species, it was taken in May, 1893 (Fountaine), and in August, 1898, in Piedmont (Tutt), and in June at Florence (Stefanelli), which shows that it is at least double-brooded, for our special dates give numbers of July and August records for Piedmont by visiting British collectors. The native collectors appear to be somewhat ignorant of the species. It is noted as occurring in August and September in Lombardy (Turati), August, in the Tuscan Apennines (Verity), whilst Spada (*Il Nat. Sic.*, xii., p. 62) gives spring, summer, and autumn for Osimo, in Sicily. Equally little is known of its occurrence in Spain, for, with the exception of a few examples picked up by Chapman, in July of various years, little seems to be known of the occurrence of the species in this country, although Seebold observes that it occurs in the neighbourhood of Bilbao, in two broods, the first in May, often abundant, the summer brood distributed and frequent, whilst Macho-Velado gives only August for Santiago. Chapman found it near Puerto de Pajares, from July 3rd-22nd, 1904. In Asia Minor it is certainly double-brooded, as it is recorded from Brussa in May (Fountaine), and September (Bethune-Baker coll.), the latter possibly third, and not second, brood. In central Asia it also appears to be double-brooded, although April and

May only are noted for Transcaucasia (Romanoff), yet Elwes mentions (*Trans. Ent. Soc. Lond.*, 1899, p. 323) the first brood as being common at Biisk in the Altai, in early June, 1898, the second generation, much larger, was out in the Bija Valley, the first week in August. T. B. Fletcher states that the species is common at Wei-hai-Wei all the warm season, apparently appearing in three broods, *viz.*, in April, June, and September, and Herz noted it in the Lena district from June 21st-July 26th. Pryer also notes that it occurs in Japan from March to October, in continuous broods. Fixsen looks on specimens taken May 20th and June 10th in Corea, as belonging to different broods. The number of broods appears to vary in America according to the latitude and altitude. In West Virginia, Edwards says (*Can. Ent.*, viii., p. 203) that the species must be successively-brooded, since fresh individuals are to be seen every month from April to September. Scudder believes that there must be more than three broods in the southern States, for the first brood appears as early as April 12th (Chapman), the second brood, June 24th (Abbot), it is noted on August 25th in Alabama (Gosse), and specimens were taken the last of October in Georgia (Oemler); but this method of selecting the dates of particular captures in different years, and assuming that they represent different broods occurring every year, is open to grave objection. In the greater part of the States, Scudder assumes three broods: (1) first appearing May 6th-10th, and continuing throughout the month. (2) July 6th-9th, continuing into early August. (3) August 19th-20th, continuing until at least the third week of September. In the White Mountains, and in the more northern parts of its American range, Scudder says that there can be only two broods,* and that worn specimens, taken just before the middle of July, were remnants of the first brood. If *amyntula* be co-specific with *comyntas*, then it occurs even earlier than any of these authors note, for Wright records it on the wing at the end of January, 1893, in Lower California, where the weather is dry, mild, and equable, and occasionally reaches 90° even in mid-winter (*Papilio*, iii., p. 117). The following recorded dates have been collected from various sources, but those from the Pyrenean district and Digne should be accepted with caution :—April 26th, 1848, the first imago, ♂, bred, the next ♂, May 9th, followed in a few days by three ♂ s and one ♀ at Glogau (Zeller); as late as September 20th, 1858, in the Rhine meadows above Uerdingen (Stollwerck); the latest for the year on September 10th, 1859, at Waldeck (Speyer); May 23rd-25th, 1871, in the Forest of Amboise, May 6th-30th, 1872, in the Forest of Amboise (Lelièvre); August 9th-12th, 1872, on Mt. Pilatus, August 18th, 1872, at Meiringen (Lang); mid-August, 1876, at Bellagio (Forbes); August 29th, 1882, at Biarritz, September 1st, 1882, at Pierrefitte-Nestalas, at

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* Scudder adds (*Butts. New Engl.*, ii., p. 925): "*Everes amyntas* occurs throughout Europe, with the exception of certain northern and north-western portions, and is double-brooded; our tailed blue *E. comyntas*, named for the resemblance to its European congener, and by some careless authors considered identical with it, is also a wide-spread insect, but even in New England, which is at the northern limit of its eastern range, it is triple-brooded." One suspects that here Scudder doth protest too much. Recent investigation suggests that these are, indeed, the same species with similar life-histories, in the Palæarctic and Nearctic regions, and, besides, Scudder fails to tell us how many broods *comyntas* has at Great Slave Lake, the mouth of the Saskatchewan river, at London, Toronto, and other places where it has been found in the more northern latitudes of America.

1665ft. elevation (A. H. Jones); in May, 1885, in the Forêt de Rennes (Oberthür); September, 1886, at Biarritz (Lemann); [June 29th-July 11th, 1887, at Vernet; July 12th-19th, 1887, at Bagnères de Luchon; July 20th-26th, 1887, at Gavarnie and St. Sauveur;] July 27th-29th, 1887, at Biarritz (Elwes); June, 1892, at Budapest (Lemann); August 18th, 1892, and preceding days, below Chiusa (Norris); May, 1893, at Olgiate Malgora, North Italy (Fountaine); June 8th-21st, 1893, on Csepel Island, below Budapest (Nicholson); [July 7th-17th, 1894, at Vernet-les-Bains,] July 25th-27th, 1894, at Biarritz (Lemann); July 27th-August 4th, 1894, in the Courmayeur district, August 21st, 1894, July 25th-26th, 1896, at Grésy-sur-Aix (Tutt); March, 1897, near Cannes (Chapman); July 18th, 1897, sparingly, at Wolfsberg (Lemann); August 11th-20th, 1897, rarely, at Susa, August 22nd, 1897, at Grésy-sur-Aix (Tutt); September 4th-14th, 1897, at Trieste, September 15th, 1897, at Pirano (Mathew); June 2nd-6th, 1898, at Biisk, August 1st-7th, 1898, in the Bija valley, in the Altai (Elwes); June 18th, 1898, at Slavisch-Brod, near Bosnich-Brod (Nicholl); July 27th, 1898, at Ischl (Hormuzaki); May 21st, 1899, on the slopes of the Vitoch, near Sofia, May 23rd, 1899, near Slivno (Nicholl); September 14th, 1899, at Yokohama (T. B. Fletcher); June 18th-23rd, 1900, at Digne, July 3rd-9th, 1900, at Budapest, common, July 12th-20th, 1900, at Herculesbad, common (Lang); July 21st, 1900, at Bad Ems, in the Taunus (Sich); July 31st-August 1st, 1900, at Lago di Loppio, near Riva (A. H. Jones); August 19th-20th, 1900, freshly-emerged and abundant at Grésy-sur-Aix (Tutt); May 21st-June 2nd, 1901, in the Upper Czerna Valley (Hirschke); July 18th-August 22nd, 1901, in the Geneva district (Reverdin); August 25th-27th, 1901, at Digne (Powell); July 29th-31st, 1902, near Chavoire (Tutt); August 14th, 1902, at Cassarate (Fountaine); April 29th, 1903, in the Geneva district (Reverdin); [July 8th, 1903, at Bozen, ♀s only (with *E. coretas*) (Lowe);] July 24th, 1903, at Moncayo, July 18th, 1903, at Canales (Chapman); July, 1904, at Mendel (Lemann); July, 1904, at Digne, July 3rd, 1904, at Entrevaux (Oberthür); July 3rd-22nd, 1904, near Puerto de Pajares, July 16th, 1904, at Puenta de los Fierros, July 24th, 1904, in Asturias (Chapman); July 15th, 1904, on the Mendel zigzags (Rowland-Brown); July 14th, 1904, one ♀ worn, at Digne (Sheldon); July 26th, 1904, and June 30th, 1907, at Mendrisio (Wheeler); July 29th, 1904, on the lower slopes of Monte Bré (Lowe); bred September 6th-18th, 1904, from pupæ reared from ♀s taken at Guéthary, eggs laid July 14th (Frohawk); May 10th, 1905, June 20th, 1905, August 19th, 1905, at Geneva (Muschamp); June 1st, 1905, in the Geneva district (Reverdin); July 13th, 1905, at Corte, in Corsica (Powell); July 14th, 1905, worn, near Guéthary, typical, August 8th-12th, 1905, a new brood, fifteen ♂s, seven ♀s, typical except two ♂s, with tendency to reduction of fulvous on underside of hindwings, near Guéthary (Sheldon); July 19th, September 3rd, 1905, at Glanon-sur-Saône (Rehfous); August 17th, 1905, between Chiasso and Como, August 18th, 1905, at Capolago (Tetley); April 15th, 1906, July, 1906, at Digne (Muschamp); May 11th-13th, 1906, at Lahr, near Freiburg (Keynes); August 19th, 1906, at Digne (Tutt); June 5th-6th, 1907, worn, and again June 19th, 1907, near Digne (Gurney); July 9th-10th, 1907, at Biarritz (Keynes); from July 15th-August 5th, 1907, at Monterfil, end of July, 1907, at Angoulême (Oberthür); July 17th-August 2nd, and again September 6th-7th, 1907, in the Geneva district (Reverdin); July 26th, 1907, at Versoix (Blachier); May 23rd-29th, 1908, at Guéthary (Sheldon); July 10th, 1908, at Melissey, Vallée d'Ognon, July 14th, 1908, at Charmes, Vosges, July 15th, at Rambervillers, July 21st, St. Maurice-sur-Moselle, July 29th-30th, at Charmes, August 2nd, 1908, at St. Maurice-sur-Moselle (Gibbs).

Habits.—At Grésy-sur-Aix, the summer-brood flies freely about the blossoms of some large bushy lucerne-plants that grow in a grassy plot, on the outskirts of the wood that covers the hill on the Grésy side. In its flight the ♂ *Everes argiades* reminds one more of *Polyommatus icarus* amongst which it flies, except that, in its gambols, it frequently flies rather higher above the ground, but it almost always returns to a lucerne-head, or other comparatively low flower that attracts it. It holds its own well among the swarms of butterflies that haunt this sunny spot—*Dryas paphia*, *Argynnis adippe*, *Enodia dryas*, *Hipparchia semele*, *H. briseis*, *Colias edusa*, *C. hyale*, *Erebia aethiops*, *Melitaea didyma*, and, among the smaller species, *Cyaniris semiargus*, *Agriades corydon*, *A. bellargus*, *Loweia dorilis*, *Rumicia phlaeas*, etc. At Chavoire, too, it loves the lucerne-flowers, for which it contests with *Thymelicus acteon* with great vigour. At Digne, it appeared to be most attracted by the *Eupatorium*-blossoms, where it rested, a pigmy, among swarms of *Hipparchia arethusa*, *Satyrus cordula*, *Erebia neoridas*, etc. Jones observes that, in August, 1882, the species was noticed flying over a species of *Erica* at Biarritz, whilst Sheldon observed the same habit in the specimens at Guéthary, but supposed the ♀ s were engaged in oviposition. Dupont says that he saw it in the Basses-Pyrénées flying round the bushes of *Ulex europaeus*, but André observed it in Saône-et-Loire flying in clover and lucerne fields, especially near the woods, as we have seen it at Grésy-sur-Aix. Schütze says that, at Rachlau, the species is regularly attracted to the flax-blossom, and Pabst notes that, at Chemnitz, he has observed that the butterfly loves to sit on low bushes, hedges, etc. It would appear that, in its more northern localities, the spring-brood is comparatively rare, *e.g.*, Zeller observes that, at Glogau, he rarely found specimens in May and June, whilst the summer-brood flies almost everywhere in July and August; he further remarks that it loves to collect in flowery spots, where it is able to obtain food, and that the females particularly seem to gather to such spots, as the foodplant, now in blossom and forming its fruit, promises a suitable abundance of food to the young larvæ. Norris observes that, in 1892, he took a number of ♀ s below Chiusa, no ♂ s at all being present with them, but that, several days later, on August 18th, he found an abundance of ♂ s flying in a large dry clover field, more than a mile distant, however, from the place where the ♀ s had been previously captured. Oberthür remarks on a very strange habit of the species in Brittany, where, in May, the butterflies occur in the meadows and grass-rides in woods, whilst, in July, they appear to be practically confined to the heaths, where the heather is high, flying freely over the tall ling. Speyer notes that, in Waldeck, the spring-brood is usually rare, whilst the second-brood is sometimes abundant; on the other hand, Rossi observes that the spring-brood sometimes swarms around Vienna. Of the uncertainty of its appearance there seem to be many records, *e.g.*, Weymer observes that, in July, 1858, he found the species in meadows near Asbruch, in the Rhine Provinces, but had never (up to 1878) seen the species there again; Nickerl notes that, in Bohemia, it is in some years very abundant, in others very rare; Gillmer writes that both broods are now very rare at Schwerin, and it appears to be doubtful whether it still occurs in its old haunts here. Lelièvre observes that the first-brood is generally very rare in the Forest of Amboise in May, whilst the second-brood is very abundant from about August 1st, the ♀s almost as numerous as the ♂s; this was so in 1871, whilst, in 1872, the May-brood was almost as abundant as the second-brood; much evidently depends upon the state of the weather, etc., in any particular year. Rössler asserts that, at Wiesbaden, the cold winter of 1879-80 completely destroyed the species, but this is not so, for, in 1888, Prideaux found it in both broods, quite near to the town, the second-brood being locally abundant. Blachier observes that, in the Geneva district, although the typical *E. argiades* is not uncommon from mid-July to September, the spring-brood is exceedingly rare in May and June. [De Nicéville observes that, in Sumatra, the sexes are usually found in different places, the ♂s on the roads, the ♀s on flowers in small jungles, but this account evidently refers to *Binghamia parrhasius*.] [Rowland-Brown records that he captured the species in July, 1905, at a patch of moisture at Vernet-les-Bains, but this does not seem a common habit, and we believe refers to *E. alcetas;* we may note, moreover, that Höfner records several *alcetas* (*coretas*), drinking at wet places in the road on July 12th on the southern foot of the Petzen, near Schwarzenbach.] Scudder says (*Butts. New Engl.*, ii., p. 917) that the flight of the butterfly in North America is quick and nervous, and it is itself so small and delicate that one easily loses sight of it as it doubles in and out among the herbage, over the tops of which—unless very low—it is rarely seen. Its flights are of short duration, and it alights frequently after some seconds of uncertain quivering on the heads or terminal leaves of plants and low shrubs and vines, especially of *Leguminosae*. Minot observed it, when alighted, holding its wings perpendicularly, or parted at an angle of about 15°, and rubbing the hindwings up and down while the forewings were motionless.

HABITATS.—Spread all over the Palæarctic and Nearctic regions, this species has been termed the "*cardui*" of the Lycænids, although *Celastrina argiolus*, excels it in this respect. Its range in altitude is not so great, rarely reaching more than 6000ft., even in subtropical countries. As may be expected its habitats are greatly varied. In Europe, it appears to haunt grassy ridings in woods, meadows on the outskirts of woods, dry exposed banks, heaths, and many other similar localities, usually, however, where there is an abundance of flowers. Speyer says that it flies, in Germany, in clearings in woods where there is a plentiful supply of flowering-plants, also in meadows in the lower mountain-districts, being often, indeed, pretty abundant in the lower part of the mountain-region. Various details are given by different observers, *e.g.*, Zeller observes that the species at Glogau haunts open woods where several species of *Leguminosae* grow, but was also found in a damp wood with much undergrowth, where its favourite foodplant, *Lotus corniculatus*, grew abundantly, whilst Prideaux says that the small spring form appeared very sparingly in May, 1888, at Wiesbaden, but the large second-brood form was far more abundant, preferring any piece of open rough ground, to the meadows in woods; in some disused limestone quarries it occurred most abundantly. We also note it recorded as not rare in meadows and fields in East Prussia, in two broods (Speiser), occurring also on the walls of the fort Courbière, at Graudenz (Riesen); the summer-brood in the Forest of Crummenhagen, in Pomerania, loves to sit on the bushes by the sides of the principal rides (Spormann); it haunts the slopes of the forts near Stettin, and Fort Wilhelm, near the glacis before the Berlin Gate, at Vogelsang (Hering); it is rare in Mecklenburg, on the grass patches by the road from Lübeck to Ratzeburg (Tessmann), and in the forest near Kleinen (Schmidt), also somewhat rare on the mosses of Borstel, Winterhude, and Schnelsen, in the district of Hamburg (Zimmermann); but not rare in meadows in and near woods in Hanover (Glitz); it occurs in the Rhine meadows above Uerdingen, in the meadows near Asbruch, and on the banks of the Ahr and Mosel (Stollwerck), and in grassy places in woods and meadows at Frankfort-on-Main, and at Biedenkopf (Glaser), also in the meadows of the Kaufunger Stiftswald, near Cassel (Borgmann); throughout Waldeck it is found in fields, banks, and on the outskirts of woods, usually rare, but occasionally abundant (Speyer); it occurs throughout Thuringia, in the plain, and on the foot-hills, in wood-clearings and on sunny slopes (Krieghoff), in the province of Saxony on the slopes of the forest of Willroda (*Ent. Ver. Erfurt*), on sunny slopes and wood-clearings, etc., near Zeitz (Wilde), and in the meadows near Halle (Stange); in Anhalt it is found in the clearings of the Lower Forest near Aken (Gillmer); on the banks of the river Oder, and in the meadows near Frankfort-on-Oder (Kretschmer): whilst in Silesia it prefers wood-clearings and is found by the edges of corn-fields in the foot-hills of the Trebnitz district (Döring), but prefers clover-fields near the town itself (Nohr); abundant in clearings of deciduous woods throughout Upper Lusatia (Möschler); and also in the heath-districts of Sprottau, etc. (Pfitzner). In the Kingdom of Saxony, it prefers sunny, sometimes rocky, hills, in the hottest part of summer, at Dresden (Steinert); in Bavaria, it chooses the dry slopes and outskirts of woods near Regensburg (Schmid); and occurs in the Isar meadows near Oberföhring (Kranz). In Hungary it appears almost everywhere in meadows and woods, but is nowhere common (Aigner-Abafi). In Austria it occurs on the outskirts of woods, or in damp places in woods in Bohemia (Nickerl); in meadows in woods in Moravia (Schneider); also in woodland meadows, and on the mountains around Linz, and in open meadows around Steyer and Wels (Brittinger); reaches up the Dammberg to 700 mètres (Himsl); occurs throughout the plain and the hill region of Salzburg, in flowery, moist meadows (Richter), and throughout the Tyrol, sparingly, to 4300ft. (Hinterwaldner). In Carinthia it flies by roadsides, and in clover fields, whilst *alcetas* occurs on the southern foot of the Petzen, near Schwarzenbach (Höfner). Mathew found it on a hillside between Trieste and Miramar, the ground covered with scrub-oak, Spanish chestnut, heath, juniper, and broom, and many other attractive flowering-plants; other butterflies besides *E. argiades* were in great profusion, the most abundant species being *Agriades bellargus*, and *Aricia astrarche*. Of its occurrence in south-eastern Europe, Mrs. Nicholl records it as being found in a little rough valley among the vineyards near Slivno, with *Coenonympha leander*, *Polyommatus anteros*, *Nomiades cyllarus*, *N. iolas*, *Aricia eumedon*, *A. astrarche*, *Agriades bellargus*, *Pontia* *daplidice*, *Callophrys rubi*, *Melitaea cinxia*, *Colias hyale*, etc., also that it occurs on some rough dry slopes on the sides of the Vitoch, a granite mountain 6000ft. high, due south of Sofia; whilst near Slavisch Brod, it haunts the Save marshes, in company with *Chrysophanus dispar* var. *rutilus*. In Belgium, it appears to be very local, and largely confined to limestone districts, *e.g.*, on the limestone rocks near Namur (Pôlet); on the "racecourse du Prince". opposite Colonster (Donckier); but in the woodland glades of the Grand Duchy (Dutreux). In France it occurs in fields and in wood-clearings, not being rare even in the neighbourhood of Paris (Godart); in the fields and pasturages on the outskirts of woods in Doubs (Bruand); in the dept. Saône-et-Loire, it flies strongly in fields of lucerne and trefoil (Constant). In Brittany, on the landes of Monterfil, in July and August, when the ling is very tall, the imagines fly over the tops of the ling, yet it is to be noted that, although the specimens of the summer brood fly in this habitat, those of the spring brood inhabit the damp meadows and grassy rides of the woods in the neighbourhood, the summer brood being much more abundant than the spring brood; whilst at Angoulême it is found in lucerne fields at the end of July (Oberthür). In the south of France, the species occurs regularly in August in a warm, sunny, corner of alarge field allowed to run to waste, on the upper edge of the scrub that covers the hills above Grésy-sur-Aix; this little spot which is about 40-60 yards long, and 10-20 yards deep, rather grassy, with some tall bushes of lucerne, and here and there a walnut tree, is a favourite corner of this species, where it flies with swarms of *Erebia aethiops*, *Satyrus hermione*, *Hipparchia briseis*, *Enodia dryas*, *Argynnis adippe*, *Dryas paphia*, *Colias hyale*, *C. edusa*, *Brenthis dia*, *Melitaea didyma*, *M. parthenie*, *M. phoebe*, *Polyommatus icarus*, *P. hylas*, *Cyaniris semiargus*, *Aricia astrarche*, *Agriades bellargus*, *A. corydon*, *Melanargia galathea*, and swarms of other species; it also occurs on the edge of the field near by, which usually has clover growing in it. In another Savoy locality, a very large form of the species was found at the end of July, 1902, on the edge of a lucerne field that slopes up from the Lac d'Annécy near Chavoire. At Digne it haunts the well-known little lateral valley, with a streamlet for a path, that runs into the Eaux-Chaudes, above "the Baths," occurring there (possibly as a third brood) in mid-August, 1906, and, at the end of April, 1897 (possibly as a first brood), whilst Gurney observed it there in mid-June, 1907, flying in company with *Cupido sebrus*, *Leptidia duponcheli*, *Loweia dorilis*, etc. Jones observes that, at Biarritz, the typical form is common in August, flying near the sea, over heathy ground, whilst he also observed it at Pierrefitte-Nestalas at 1665ft. elevation; and Sheldon records that, near Guéthary, it inhabits a series of small swamps and wooded hollows, flying in mid-July and August, with *Lampides boeticus*. In the north of Italy its habitats are varied. Lowe states that on Monte Bré he found only *E. alcetas* (*coretas*) at the summit on June 13th, 1903, whilst on July 29th, 1904, lower down on the same mountain, he found only typical *E. argiades*. Behind Susa we found the species going over in mid-August, 1897, in a lovely little wooded gorge, where *Lampides boeticus* was not uncommon, and, at the end of July, 1894, on the slopes just above Courmayeur. Tetley disturbed some ♂ specimens on a dull day in August 1905, on the edge of a field off the road between Chiasso and Como, close to the lake, the field growing some species of

Trifolium as a crop, whilst near Chiusa, Norris took them in a large dry clover field. Frey states that, in Switzerland, the species occurs throughout the whole of the lowlands, in open, dry, or moist places in woods, usually not plentifully. Tetley found it in August, 1905, in vineyards, close to Capolago station, the ground covered with a rank growth of late summer flowers, including many *Leguminosae*, where swarms of *Melitaea didyma* and common Pierids were flying. In Bukovina, Hormuzaki says that it is common in the Solka district, from July to mid-August in woodland-meadows, and clover fields. Eversmann observes that it flies not at all rarely in grassy fields, and grassy places in woods in the Lower Urals. Little seems to be noted about the habitats of this species in Asia. Elwes captured the first brood near Biisk in early June, 1898, the second in August in the Bija valley. Walker observes (*Trans. Ent. Soc. Lond.*, 1895, p. 461) that he has seen only a few Hong-Kong examples of the species, which had been taken by Dr. W. W. Beveridge in a grassy place on the south slope of the island. These, he adds, agree well with specimens from the Chusan Islands where the insect is very common. Manders, in his notes on the "Lep. of the Shan States" (*Trans. Ent. Soc. Lond.*, 1890, p. 528), says that *parrhasius* is very common at a low elevation, whilst *argiades* is equally common, but occurs at higher elevations. Scudder says that, in the United States, the butterfly haunts the roadside or overgrown pasture-tracks in the vicinity of woods. Dr. Harris observed it in dry woods and pastures, frequently alighting on flowers of *Hedysarum* or *Lespedeza*. In Iowa, Allen found the species on low ground, and about pools of water after a shower; also at the edges of groves by river-banks. Godman and Salvin state that, in Central America, *e.g.*, Guatemala, the species is an inhabitant of the mountain region, and is chiefly found at an elevation of 3000ft. and upwards.

Reputed British examples of Everes argiades.—This species appears to have even less standing as a member of our native fauna than *Lampides boeticus*. It occurs locally in the warmer parts of Brittany, and one suspects that the specimens reported to have been captured here have been immigrants. Our "distribution" lists will give an idea of its enormous range, and its capacity for spreading its area must be a great one. It is very sensitive to boreal climatic conditions, and fails to establish itself almost everywhere on the continent above 54° N. lat.; possibly our prolonged winter, rather than its low temperature, is against its becoming a permanent resident. The following are the reputed British captures:—

1 and 2.—♀, rather worn, captured August 18th, 1885, by C. O. Pickard-Cambridge, on Bloxworth Heath, Dorset; ♂, in good condition, taken August 20th, by A. Pickard-Cambridge, near same spot. Repeated search since has failed to discover any others (*Entom.*, xviii., p. 249). Exhibited at meeting Ent. Soc. London, November 4th, 1891 (see *Ent. Rec.*, ii., p. 259), also at meeting of Sth. Lond. Ent. Soc., November 12th, 1891 (see *Ent. Rec.*, ii., p. 302).

3.—Sex ?. Worn, captured August 21st, 1885, near Bournemouth, by Philip Tudor, a lad then at school with one of Mr. Cambridge's sons. Named by McRae as doubtfully *Lampides boeticus*; examined by Cambridge and determined as *E. argiades*; the Bournemouth locality only 14 miles from Bloxworth Heath (*Entom.*, xviii., p. 252). Exhibited at meeting of Ent. Soc. Lond., November 19th, 1902 (see *Proc. Ent. Soc. Lond.*, 1902, p. xl).

4-5.—Two ♂s, in a collection in a ruined state sold by a "gentleman" living in Frome, to J. S. St. John. The "friend" stated that these were taken "with several others, eleven years ago (1874), not two miles from Frome, close by a small quarry " (*Entom.*, xviii., pp. 292-3). Exhibited by St. John at meeting of Ent. Soc. London, on December 2nd, 1891, as " taken by Dr. Marsh, in 1884, in Somersetshire " (see *Proc. Ent. Soc. Lond.*, 1891, p. xxxi). Sold by St. John at Stevens' sale-rooms, January 22nd, 1894, the specimens producing £4 10s. (see *Ent. Rec.*, v., p. 40). Bought for the " Dale collection." Transferred with the " Dale collection " to the Hope Museum, and reported on by J. J. Walker, as " A pair in good order ; the ♂ has a circular ticket, ' Dr. Marsh, 1874, Whatley ' ; the ♀ ' Whatley, Somerset,' at side. These would appear to be the specimens recorded by the Rev. J. Seymour St. John, in *Entom.*, xviii., p. 292 " (*Ent. Mo. Mag.*, xliii., p. 132). It is interesting to learn that these two insects are now " in good order," as they were " saved from a collection fast going to ruin," and had been presumably " cleaned and doctored " by St. John ; and that they have changed from " both male specimens " (*Ent.*, xviii., p. 292) to a male and female. It is also interesting to bear in mind that three *Vanessa antiopa* in the " Burney collection " had been supplied by " Dr. Marsh, Norfolk," and sold for 6s. each (see *Ent. Rec.*, v., p. 40). Also that in the collection of " Dr. Marsh, of Cawston, Norfolk," Barrett detected a number of *Syrichthus alveus*, taken in Norfolk about 20 years before (*Ent. Mo. Mag.*, xxviii., p. 244).

[6.—♂ specimen in recorder's collection, captured 1895 or 1896, at Wrington, about twelve miles north of Bristol. (This was recorded by " R. D. R.," *Entom.*, xxxvii., p. 47, in 1904, with the remark, " I was not aware of the name of my insect until I " saw the figure of this butterfly in the new issue of Kirby's *Butts. and Moths of Europe*." We object most strongly to records appearing without a name ; in the case of rare British insects we consider such records purposeless.)]

Distribution.—Throughout the Palæarctic region, including the whole of Europe from Spain, Italy and Greece in the south, to Russia (about 60° N. lat.) in the north, throughout Asia Minor, and northern and central Asia to the Himalayas and China (to about 30° N. lat.), including western Asia, southern Siberia, Mongolia, Tibet, eastern China, Japan, Corea, Manchuria, and Amurland. In the form *diporides* this species overlaps *dipora* and *parrhasius* in the southeastern part of Asia, and appears to enter the Oriental region in India. [It is recorded from India, throughout the East Indies, Australia, etc., almost certainly erroneously, instead of *dipora* or *parrhasius*, which de Nicéville does not consider distinct.] Its range in the Nearctic area has already been noted (see our remarks under *comyntas*, etc., *anteà* pp. 73-76). Asia : Asia Minor, distributed (Rebel), Amasia, Lenkoran (*teste* Rühl), Brussa (Dieckemann) ; Altai mts.—Biisk, Bija valley (Elwes), Ongodai (Jacobson) ; Tomsk district—Minusinsk (Brit. Mus. Coll.) ; Thian-Shan and Kouldja district (Alphéraky); Ala Tau (Haberhauer), Lepsa (*teste* Rühl) ; Pamirs—New Margelan (Grum-Grshimailo) ; Thibet (Oberthür) ; India*: Western Ghats—Kanara district (Bell), the moister parts of Ladak, throughout Kashmir, all along the Himalayas (Nicéville), Massuri (Hügel), Cherra Punji, North-west India, North-west Himalayas, Khasia, Assam, and Maymyo in the North Shan States (Chapman *teste* specimens in Brit. Mus. Coll.) ; North, Central, and West China—Shan-Tung (Seitz), Sz. Chuan (Bethune-Baker coll.), Mongolia—Chang-Hai (Oberthür), Kwei-Chow Province, Kiu-Kiang on the Yangtse (Leech), Ichang Gorge, Chang-Yang (Pratt), Yunnen (Oberthür) ; Hong-Kong, Chusan Isles (Walker), Wei-hai-Wei (Fletcher) ; Manchuria (Oberthür) ; Corea (Herz), West Corea—Chemulpo, South-east Corea (Brit. Mus. Coll.) ; Amurland nr. Permskoe, Mülki (*teste* Rühl), Askold (Oberthür), Bureja Mts., Ussuri, Pokrofka, Chabarofka, Baranofka, Sutschan, Vladivostock (Staudinger), Raddefka, Dahuria, Schilka (*teste* Rühl), Kentei district (Dorries), Lena district—Wilui (Herz) ; Japan, throughout—Yokohama (Pryer), Nikko, Satsuma, Fushiki (Leech), Nagasaki (Herz), Tokio (Elwes), Hakodaté, Kobé (Butler), Kiso-Gawa, Asahiga

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* Want confirmation—Burma, the Malda district, Bholahât, Orissa, Ganjam, Nagpur, Mhow, the Nilgiris, Travancore, Ceylon, the Nicobar Isles, including Nankowri and Katschall (Nicéville) ; Further India—Tenasserim and the Malay subregion (Bingham) ; East Indies—Java (Horsfield), Malacca, Singapore (Distant), Celebes (Snellen), Sumatra (Nicéville), Nais Island (Kheil). [Many (if not all) of these refer, no doubt, to *dipora*, Moore, or *parrhasius*, Fab.]

Take, Suna Saki (Brit. Mus. Coll.), Kyotó (Bethune-Baker coll.). Europe: Austro-Hungary: In Austria not abundant (Höfner), in Hungary, throughout (Aigner-Abafi); Bohemia—Prague, Krc, Kuchelbad (Nickerl); Moravia—Brünn, distributed but rare (Schneider), Kremsier (Fritsch); Upper Austria—Linz, Steyer, Wels, etc., not common (Brittinger), Pöstlingberg, Pfenningberg, Steyr, Schlierbach, on the Dammberg to 700 m. (Himsl); Lower Austria, throughout the valleys—near Vienna, sometimes very abundant in the Hinterbrühl, Dornbach, the Tulbinger Kogel, rather rare (Rossi), Gresten (Schleicher), Hernstein (Rogenhofer); Salzburg, sparingly—the Schall Moss, Leopoldskron Moss, the Aigner Valley, the Glockner (Richter), Salzburg (Fritsch); Tyrol—in the lower mountain regions up to 4300ft., but not frequent, Innsbruck (Hinterwaldner), Botzen, Trient (Mann), Mendel (Lemann), throughout the Dolomite district (Mann and Rogenhofer), Tratzberg, Schluderbach (Heller), Bregenz (Fritsch); Carinthia—Lavantthal, singly, Pörtschach, Villach, singly, at the southern foot of the Petzen in the Topla ditch, near Schwarzenbach (Höfner), Wolfsberg (Lemann); Styria—Ischl (Hormuzaki); Carniola—the Nanos slopes (Mann); Dalmatia—Trieste, Pirano (Mathew); Croatia (Mann); Hungary—Budapest, Orsova, Kronstadt (Tutt coll.), Herculesbad (Lang), Csepel Island (Nicholson), Arva-Varallya, Kocsocz, Zsolna (Vāngel-Jenö), Eperjes (Husz), Kaschau (Bethune-Baker coll.), Peszér, Szentes, Szegedin, Nagyvárad, Parád, Gyöngyös, Vécz, Pécs, Szaár, Csolnok, Györ, Sopron, Pozsony, Lévárd, Tavarnok, Verebély, Gács, Rozsnyo, Teplicz, Dristoma, Arvaváralja, Gölniczbánya, Igló, Tátra, Kassa, Szatmár, Kiralyháza, Kujzt, Berlebás, Ungvar, St. Gothárd, Fogaras, Elöpatak, Nagyszekn, Nagyád, Réa, Ujtzeged, Mehádia, Vinkovcze, Lipik, Délya, Josifdol, Fiume (Aigner); Cracow—Bielang, Zabriezow (Zebrawski); Bucovina—Czernowitz, very common (Hormuzaki); Galicia—Radlowice, Spas, Stupnica, Lívow, Janow, Pieniaki, Krakowskie (Nowicki). Belgium: Ortho (Slégers), Virton, Denée (Hennin), Namur, Embourg, rare, near Colonster (Donckier), St. Servais, rare (Castin), Bouge, Dinant, rare (Lambillon), Mt. de la Motte, near Huy (Pôlet). Bosnia and Hercegovina: local and rare, failing in the southern Karst district, and not extending more than 400 m. above sea-level, Slavisch Brod near Bosnisch Brod (Nicholl), Dervent (Rebel), Bosnatal (Hilf), Jaice, Pale, Podorozac (Apfelbeck), Maglai (Brit. Mus. coll.). Bulgaria and East Roumelia: West Bulgaria near Slivno, not common, the Vitoch near Sofia (Nicholl). Corsica: Cauro (Mann), Corte (Powell). Denmark: (Dohlmann, Brit. Mus. coll.). France: Widely distributed—Ain—Ferney (Drexler); Aisne—rare, St. Quentin, Rouvray (Dubus); Allier—Moulins, Avernes on the banks of the Allier (Peyerimhoff), Alpes-Maritimes (Bromilow); Aube—common (Jourdheuille); Aude—Pentes des Corbières, Garrigues de Conques (Mabille); Auvergne (Oberthür); Basses-Alpes—Digne (Tutt), Entrevaux (Oberthür); Basses-Pyrénées—Biarritz (Lemann), generally in the lower regions (Rondou), Guéthary (Sheldon); Bretagne, general (Griffith); Calvados—Arromanches (Dupont); Charente-Inférieure—St. Mariens (Oberthür); Charente—Angoulême Cher—Sologne, St. Florent (Sand); Côte-d'Or—Glanon-sur-Saône (Rehfous); Doubs (Bruand); Dordogne—Bergerac (Tarel); Eure-et-Loir—Châteaudun (Guenée); Gironde—environs of Bordeaux (Rt. Brown); Haute-Garonne—Bouconne, St. Jean, Larramet, Encausse, Fougeron, Luchon, etc. (Caradja); Haute-Marne—Langres, Latrecey (Frionnet); Hautes-Pyrénées—as for Basses-Pyrenées (Rondou), Pierrefitte-Nestalas (A. H. Jones), St. Sauveur, Gavarnie (Elwes); Haute-Saône—Melissy, Valley of the Ognon (Gibbs); Haute-Savoie—Chavoire near Annécy (Tutt); Haute-Vienne—Limoges (Samy); Ille-et-Vilaine—Monterfil, forest of Rennes, Montfort (Oberthür); Indre—forest of Amboise (Lelièvre), Brenne, (Martin), Nohant (Sand); Indre-et-Loire—St. Avertin near Tours (Meade-Waldo); Isère (Frionnet), near Grenoble, the valley of the Drac (Goossens); Loire-et-Cher—Forêt de Russy rather common (Chevillon); Loire-Inférieure—Savernay (Dehermann-Roy); Maine-et-Loire (Delahaye); Marne—Rheims, Epernay, very rare (Demaison), Morbihan—Vannes, very common (Griffith); Meuse—Clermont (Demaison); Meurthe-et-Moselle—Nancy, Champ d'Afrique (Cantener); Oise (Frionnet); Orne—forest sf Audaine (Moutiers); Puy-de-Dôme—Auvergne, Mt. Dore (Sand), Thiers (cit. Kane); Pyrénées-Orientales—Sorède (Sprüngerts), Villefranche-le-Conflent, Vernet (Oberthür); Saône-et-Loire—scattered (André), Caves-Joyaux, very rare (Constant); Sarthe (Desportes); Savoie—Grésy-sur-Aix (Tutt), Brides-les-Bains, Salins (Reverdin); Seine—near Paris (Godart); Seine-et-Marne—Ozouer (Goossens); Fontainebleau (H. Brown); Seine-Inférieure—Cavée de Dieppedalle (Frontin), rare (Noel); Vienne—Charroux (Oberthür); Vosges—Epinal, at St. Antoine (Cantener), Charmes, Rambervillers, St. Maurice-sur-Moselle (Gibbs). Germany: throughout, except in some districts of the northwest, where the butterfly has nearly, or quite, reached its northern limit (Speyer); East and West Prussia, sparingly—Stargardt, Königsberg, Jetau, Dantzig, Elbing, Rastenburg, Gilgenburg (Schmidt), Spandienen, Graudenz (Riesen), Tilsit, Cranz, Rauschen, Warnicken, Wargen, Dammhof, Gross-Raum, Metgethen, Löwenhagen, Tapiau, Frisching, Wehlau, Norkitten, Insterburg, Gerdauen, Bartenstein, Wöterkeim, Domnau, Petershagen, Ludwigsort, Mohrungen, Osterode, Allenstein, Ganglau, Bischofsburg, Cruttinnen, Sorquitten, Angerburg, Gawaiten, Rominten, Lyck, Neidenburg, Damerau, Kulm, Münsterwalde, Marienburg, Ohra, Löblau, Kladau, Zoppot, Gora, Alt-Kischau, Pr. Stargard, Jastrow (Speiser); Pomerania, not common—the Julow, near Stettin, Fort Wilhelm, Vogelsang, Nemitz, Hökendorf, Schrey near Garz-on-Oder (Hering), very rare at Greifswald, Friedhof, and Stralsund (Paul and Plötz), rare at Pennin, Forest of Crummenhagen (Spormann); Mecklenburg—Neustrelitz, Sülze, Rülow (Boll), near Kleinen, Zickhusen (Schmidt), Lübeck to Ratzeburg, rare (Tessmann); Hamburg—Eppendorf (Tessien), the mosses of Borstel and Winterhude, Schnelsen (Zimmermann), Hamburg (Laplace); Hanover—Lüneburg, singly (Machleidt and Steinworth), Bremen, Wildeshausen, very rare (Rehberg), Hanover (Glitz), Osnabrück (Jammerath), Hameln (Jordan); Rhine Provinces—above Uerdingen (Stollwerck), Neuenahr (Weymer), Trier, fairly abundant, Brohl valley, Boppard, Bingen, Aachen, on the banks of the Ahr and Mosel, Elberfeld, near Asbruch (Stollwerck), in the Hülserbruch near Krefeld (Rothke); Hesse—Wiesbaden, not rare (Rössler), Oberursel, rare (Fuchs), Hanau, generally distributed (Limpert and Röttelberg), the western slopes of the Westerwald, Wied-Selters district (Schenck), the Vogelsberg, Wetterau, Giessen, Frankfort-on-Main, Biedenkopf (Glaser), the Stadtwald of Frankfort-on-Main, throughout, but singly, the Mörfelder road near the Gehspitze, the Bieber Höhe at Offenbach, abundant, also in the Hegwäldchen of the Niedgau, the Taunus, Soden (Koch), near Worms, abundant (Glaser), Darmstadt (Schenck), Cassel, the Kaufunger Stiftswald (Borgmann); Waldeck—throughout (Speyer); Thuringia—throughout, not abundant (Krieghoff), Gotha (Knapp) Gera (Ent. Verein), Mühlhausen, Rudolstadt, Sondershausen (Jordan); Province of Saxony—Erfurt (Keferstein and Werneburg), forest of Willroda near Windischholzhausen, not frequent (Ent. Ver. Erfurt), Ossig, Raabe, Droyssig at Zeitz (Wilde), Naumburg, Nordhausen, on the Kyffhäuser (Jordan), the Dölauer Haide, rare, near Halle, not rare (Stange); Anhalt and Hartz—Dessau, rare (Richter), Aken (Gillmer), Brunswick, rare (Heinemann), Wernigerode (Fischer), Friedrichsbrunn, rare (Reinecke), Quedlinburg, Osterode, Göttingen (Jordan); Brandenburg—Finkenkrug (Pfützner), near Frankfurt-on-Oder (Kretschmer), Bremgarten (Brit. Mus. coll.); Posen—sparingly distributed, Posen, the Eichwald, Kobylepole, Schilling (Schultz); Silesia—Glogau (Zeller), Trebnitz district (Döring), the Bitke, near Trebnitz (Nohr), the Görlitzer Heide (Ostwold), Upper Lusatia, abundant throughout (Möschler), Sprottau, Seufzen, Ebersdorf, Mückendorf, Dittersdorf, Reuthau, Hochwald, Altkirch (Pfitzner); Kingdom of Saxony—Dresden (Steinert), Saxon Upper Lusatia, distributed, Baruth, Rachlau (Schütze), Chemnitz, Hilbersdorf (Pabst), Leipzig district—singly at Beucha, Lindhardt, Harth, Wurzen, Leisnig, Rosswein, Nossen, Hainichen, Lausigk, Dresden district—not frequent at Lössnitz, Plauengrund, Meissen, Gröbern, Gohlis, Weinböhla, Oberau, Spitzgrund, Jahna valley, Freiberg, Dippoldiswalde, Gauernitz, near Dresden, Bautzen district—abundant at Baruth, Rachlau, Kamenz, not frequent at Zittau-Lausche, Bautzen, Chemnitz district—not rare at Hilbersdorf, Rabenstein, Hermersdorf, Euba, Crimmitschau rare, Werdau Wood, Bad Elster, not rare, Annaberg, Schneeberg, not frequent (Entom. Ver. Iris); Bavaria—Regensburg (Hofmann and Herrich-Schäffer), the Isar meadows, near Oberföhring, Munich (Kranz), Augsburg, rare (Freyer), Kempten, near Wagegg (Kolb); Württemburg—distributed but scarce, Stuttgart, rather rare, Tübingen, rare (Seyffer); Baden—abundant everywhere, Karlsruhe, Turmberg, St. Michaelsberg, etc. (Gauckler), Lahr, near Freiburg (Keynes); Alsatia (Meess and Spuler); Rhine Palatinate (Bertram). GREECE: Acarnania (Kruper *teste* Staudinger). ITALY: Piedmont—Susa, Courmayeur district (Tutt), Certosa de Pesio, Chiusa (Norris), between Chiasso and Como (Tetley), Bellagio (Forbes), Olgiate Malgora, Sondrio (Fountaine), Lago de Loppio, near Riva (A. H. Jones), Lombardy (Turati), Tuscany, not common, Florence, Valdarno, Pisa (Calberla), Tuscan Apennines—Vallombrosa 800mm.-900mm. (Verity), Sicily—Osimo (Spada). NETHERLANDS: rare—Gelderland, Zutphen, Varsseveld (Snellen); Grand Duchy of Luxembourg (Dutreux). ROUMANIA: very common (Rebel), Neamtz, Hangs, Dulcesti, Valeni—Grenzgebirge, Tultscha, Hatweiden, Comanesti (Fleck); Tomos

Pass (Tutt coll.), the mountains near Valesaca (*teste* Rühl). Russia: Baltic Provinces—Pskov (Kusnezow), Bathen (Teich); St. Petersburg district (Ershoff), near Gorki (*teste* Rühl); Transcaucasia—Tiflis, Borjom (Romanoff), Central Caucasus (Schaposchnikov), Lower Ural district—Province of Casan, Orenburg, Saratov, near Casan, Sarepta, Sergievsk, &c. (Eversmann); Wiatka Govt. (Kroulikowsky); Black Sea district—Bagovitza (Grum-Grishimailo). Servia: Belgrade (Tutt coll.). Spain: Galicia—Santiago (Velado); Castile—Canales, Moncayo (Chapman); Vizcaya—near Bilbao (Seebold); Asturias—Puerto de Pajares, Puenta de los Fierros (Chapman), Picos de Europa (Nicholl). Switzerland: Local throughout the lowlands (Frey); Basle—Liestal; Zürich—Zürich (Frey); Lucerne—Lucerne (Fison); Unterwalden—Pilatus; Bern—Meiringen (Lang); Vaud—Crassier (de Loriol); Geneva district—Pinchat, Veyrier, Versoix, Onex (Blachier), Hermance, Chambèsy (Reverdin); Ticino—Capolago (Tetley), Monte Bré (Lowe), the Val Cassarate (Fountaine), Mendrisio (Wheeler); Schwyz—Brünnen (Murray). Turkey: Bulair Lines, near Gallipoli (Mathew).

Genus: Cupido, Schrank.

Synonymy.—Genus: **Cupido,** Schrk., "Faun. Boica," ii., pt. i., pp. 153, 206, 215 (1801); Kirby, "Journ. Linn. Soc. Zool.," x., pp. 498-9 (1870); "Syn. Cat.," p. 371 (1871); Auriv., "Bihang till Handl.," pp. 23, 26 (1880); Tutt, "Brit. Butts.," p. 160, pl. ii., fig. 10 (1896); "Ent. Rec.," vii., pp. 220, 300 (1896); Reut., "Ent. Rec.," x., p. 97 (1898); Grote, "Schmett. Hildesh.," p. 42 (1897); Wheel., "Butts. Switz.," p. 24 (1903); Tutt, "Ent. Rec.," xviii., pp. 130, 132 (1906). **Papilio,** Fuess., "Verz.," i., p. 31 (1775); Schneid., "Sys. Besch.," p. 270 (1787); Lang, "Verz.," 2nd ed., p. 58 (1789); Bork., "Rhein. Mag.," i., p. 285 (1793); Lewin, "Ins. Gt. Brit.," i., p. 82, pl. xxxix., figs. 3-4 (1795); Hb., "Eur. Schmett.," pl. lviii., figs. 278-9 (1796); text. p. 46 (1806); "Raupen," etc., i., pl. xxxiv., figs. *c-d* (*circ.* 1800); Ill., "Schm. Wien.," ii., p. 268 (1801); Hoffmansegg, "Ill. Mag.," iii., p. 185 (1803); Herbst, "Nat. Sys. Ins.," xi., p. 190, tab. 311, figs. 4, 5 (1804); Ochs., "Die Schmett.," i., pt. 2, p. 22 (1808). **[Papilio-Plebius-] Ruralis,** Esp., "Schmett. Eur.," i., pt. i., p. 338 (1779), pl. xxxiv. (supp. x.), fig. 3 (1777); supp., p. 71 (1797?); Bergs., "Nom., iii., p. 5, pl. l., figs. 5-6 (1780); Fab., "Mant. Ins.," ii., p. 73 (1787); Bkh., "Sys. Besch.," i., p. 177 (1788); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 75 (1789); Brahm, "Ins. Kal.," p. 310 (1791); Don., "Brit. Ins.," ix., p. 73, pl. 322, fig. 1 (1795); Haw., "Lep. Brit.," p. 48 (1803). **[Hesperia-]Ruralis,** Fab., "Ent. Syst.," iii., pt. i., p. 295 (1793); Panz., "Sch. Icones Ins.," p. 151 (1804). **Polyommatus,** Latr., "Nat. Hist. Crust.," xiv., p. 121 (1805); "Gen. Crust. Ins.," iv., p. 207 (1809); Leach, "Edin. Encycl.," ix., pt. i., p. 130 (1815); Latr., "Enc. Méth.," ix., p. 617 (1819); Curt., "Brit. Ent.," v., p. 9 (1824); Stphs., "Illus.," i., p. 86 (1828); "Ins. Cat.," 1st ed., p. 22 (1829); Bdv., "Eur. Lep. Ind.," p. 13 (1829); Meig., "Eur. Schmett.," ii., p. 8, pl. xlvi., figs. *5a-c* (1830); Ramb., "Faun. And.," p. 269 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 62 (1839); Westw., "Syn. Gen.," p. 88 (1840); Humph. and Westd., "Brit. Butts.," p. 100, pl. xxxi., figs. 4-8 (1841); Sta., "Man.," i., p. 58 (1857); Hein., "Schmett. Deutsch.," i., p. 74 (1859); Kirby, "Man.," i., p. 110 (1862); Gärt., "Berl. Ent. Zeit.," p. 115 (1865); Kirby, "Eur. Butts.," i., p. 46, pl. xiv., fig. 3 (1882); Buckl., "Larvæ, etc.," i., p. 100, pl. xiv., fig. 2-2*e* (1886); Dale, "Brit. Butts.," p. 58 (1890); Barrt., "Lep. Brit. Is.," i., p. 92, pl. xiv., figs. 1-1*c* (1893). **Lycaena,** Oken, "Lehrb.," ii., p. 719 (1815); Ochs., "Die. Schmett.," iv., p. 25 (1816); Sam., "Ent. Comp.," p. 242 (1819); Treits., "Die Schmett.," supp., p. 65 (1834); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); Neust. and Korn., "Schmett. Schles.," p. 45 (1842); H.-Sch., "Sys. Bearb.," i., p. 111 (1843); Evers., "Faun. Volg.-Ural.," p. 47 (1844); Dup., "Cat. Méth.," p. 30 (1844); Hydrch., "Lep. Eur. Cat. Meth.," p. 13 (1851); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 492 (1852); Led., "Verh. zool.-bot. Gesell.," i., pt. 2, p. 19 (1852); Wallgrn., "Skand. Dagf.," p. 237 (1853); Ramb., "Cat. Lep. And.," p. 42 (1858); Speyr., "Geog. Verb. Schmett.," i., p. 248 (1858); Dbld., "Syn. List," p. 2 (1859); Staud., "Cat.," 1st ed., p. 6 (1861); Snell., "De Vlind.," i., p. 58 (1867); Berce, "Faun. France," i., p. 147 (1868); Nolck., "Lep. Fn. Estl.," i., p. 57 (1868); Butl., "Cat. Diurn. Lep.," p. 169 (1869); Newn., "Brit. Butts.," p. 134, fig. 46 (1871); Staud., "Cat.," 2nd ed., p. 13 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 104 (1872); Bang-Haas, "Nat. Tids.," ix., 3rd ser., p. 394 (1874); Curò, "Bull. Soc. Ent. Ital.," vi., p. 113 (1874); Cunì-y-Mart., "Lep. Barc.," p. 19 (1874); Frey, "Lep. Schweiz," p. 21 (1880); Lang, "Butts. Eur.," i., p. 128 (1884); Lampa, "Ent. Tids.," vi., p. 15 (1885); Kane, "Eur. Butts.," p. 50 (1885); Auriv., "Nord. Fjär.," i., p. 15, pl. vi., fig. 3 (1888-91); Rühl, "Gross-Schmett.," i., p. 295 (1892-5); Staud., "Cat.," 3rd ed., p. 89 (1901); Lamb., "Pap. Belg.," p. 243 (1902). **Zephryus,** Dalm., "Handl.," p. 96 (1816). **Nomiades,** Hb., "Verz.," p. 67 (1816-18); Stphs., "Illus.," iv., supp., p. 404 (1834), Scudd., "Hist. Sketch," p. 228 (1875). **Pithecops,** Horsf., "Cat. Lep. E.I.C. Mus.," p. 66 (1828). **Argus,** Dup., "Pap. Fr.," supp. i., p. 389 (1832); Zett., "Ins. Lapp.," p. 912 (1840). **[Polyommatus-]Nomiades,** Stphs., "List," 1st ed., p. 19 (1850); 2nd ed., p. 17 (1856). **Zizera,** Moore, "Lep. Ceyl.," i., p. 78, *in part*, type only (1881); de Nicév., "Butts. Ind.," iii., p. 111, *in part*, type only (1890); Leech, "Butts. China," ii., p. 323 (1894); Kirby, "Handbook, etc.," ii., p. 105, pl. xlix., figs. 4-5 (1896); South, "Brit. Butts.," i., p. 176, pl. cxiv.-cxv., figs. 1-8 (1906).

As we understand it, the genus *Cupido* contains a very small number of closely allied Everid species, of which *minimus*, Fuess., and *sebrus*, Bdv. are the best known. The name, however, was created by Schrank for the whole of the *Ruralides*, and his hugely heterotypical genus is diagnosed (*Fauna Boica*, ii., pt. i., p. 153) as follows :—

> *Antennae :* threadlike, clubbed at the tip ; the club longish, flattened. *Feet :* six, almost alike. *Wings :* almost alike, erect when at rest.

Its comprehensiveness may be gleaned by his later treatment of it (*op. cit.* pp. 206-220). It includes all the "coppers," "blues," and "hairstreaks," and is practically identical with Linné's *Rurales*, Borkhausen's *Plebeii-Rurales*, and Fabricius' *Rurales*. He subdivides it into the same three natural sections as Schiffermüller and Denis, Borkhausen, etc. His short diagnosis of these groups reading as follows :—

> CUPIDO.—A. Shiny-gold butterflies with narrow shield-like larvæ. *Feet :* the first pair smaller. *Wings :* with black spots and dots beneath ; the hindwings with an orange-coloured marginal stripe, and the hind-margin somewhat angular, often much shaded with black. *Larva :* onisciform, with short hairs : the hairs reddish ; the head brownish. *Metamorphosis :* near the earth into a very blunt, brownish pupa, which is fastened strongly with threads at the centre and round the abdomen.
>
> (*a*) The ♂s almost unspotted.—*C. virgaureae*, L.; *C. hippothoë*,[*] W.V.; *C. chryseis*, W.V.
>
> (*b*) Both sexes spotted.—*C. phlaeas*, W.V.; *C. circe*, W.V.
>
> B. Butterflies with many eye-spots, with convex shield-like larvæ. *Wings :* blue above (in the ♂), or (more often in the ♀) blackish ; beneath greyish, with many eye-spots. *Larva :* onisciform, of fairly even breadth, fairly convex, generally brightly coloured. *Metamorphosis :* into a whitish, dark-spotted, naked pupa, on the stem of a plant, or half in the earth.
>
> (*a*) Without reddish-yellow transverse band on the underside of the hindwing —*C. arion*, Göze, *C. alcon*, W.V., *C. acis*, W.V., *C. damon*, W.V., *C. damoetas*, W.V. (*cyllarus*, Esp.), *C. argiolus*, W.V.
>
> (*b*) With an orange-spotted band on the hind-margin of the wings beneath—*C. eumedon*, Esp., *C. corydon*, Scop., *C. adonis*, W.V. (*bellargus*, Esp.), *C. alexis*, W.V. (*icarus*, Esp.), *C. agestis*, W.V. (*alexis*, Scop.), *C. argus*, W.V., *C. battus*, W.V. (*telephii*, Göze), *C. puer*, Schrk. (*minimus*, Fuess. + *tiresias*, Sys. Besch., 260 + *pseudolus*, Bkh.).
>
> C. Butterflies with a small tail, with flat shield-like larvæ. *Wings :* on the underside of the hindwing a white transverse streak or a row of white spots, a small tail on the margin. *Larva :* onisciform, smaller towards the back part ; with short, fine hair throughout its length. *Metamorphosis :* into a somewhat rough pupa, flat beneath, much raised above ; on plants, to which they fasten themselves with several threads drawn over the back—*C. rubi*, W.V., *betulae*, L., *quercûs*, Göze, *pruni*, W.V., *spini*, W.V.

Between 1816 and 1818, Hübner used (*Verz.*, p. 77) the generic name *Cupido* for three species, *C. liger*, Cram., *C. amor*, Fab. (*triopas* Cram.), *C. chrysus*, Cram., none of which is included among Schrank's species placed originally in the genus, nor do they appear to have any generic connection with any of Schrank's species. In 1870, Kirby, in a paper entitled "Generic Nomenclature of Diurnal Lepidoptera" (*Journ. Linn. Soc. Zool.*, x., pp. 498-499), writes of the genus *Cupido*, "The true type of *Cupido* appears to be *alsus*." He does not here, however, give his reason, but Scudder notes (*Hist. Sketch*, p. 293) that Kirby has written him that this was because "Schrank confounds *alsus* and *argiades* as sexes under his *puer*, and the name *puer* seems to have suggested *Cupido*," which Scudder says seems to him "rather strained." Now we have often thought that *Cupido* was suggested by the vigorous, active, open love-making of the Lycænids, but whether "*puer*" had anything to do with it is another matter, and, apart from this fanciful reason, we have to deal with the facts, and, as we agree that *puer* = *argiades* + *alsus* (*minimus*) (see *anteà*, p. 52), there can be no doubt that *minimus* was included in Schrank's original species, and that Kirby's selection of *minimus* as type was not only the first selection made but quite legitimate. His later action, therefore, of changing his type to the other sex of *puer*, *i.e.*, *argiades* (*Handbook of Lepidoptera*, ii., p. 85), is quite *ultra vires*, and it is clear that the transference of a generic type in this way would lead to endless confusion. Here, too, Kirby elaborates his idea for making *puer* the type, for he says: "The only species which Schrank described at unusual length under *Cupido*, was *C. puer*, which subsequently proved to include two species, *C. argiades* and *C. alsus*, placed together as ♂ and ♀. The large space given to *C. puer*, in conjunction with the name is sufficient to establish the ♂ (*C. argiades*) as the indubitable type of *Cupido*," and this in spite of the fact that he had chosen the ♀ for this purpose more than 20 years before. It may be noted that, in 1871, Kirby uses (*Syn. Cat.*, p. 345) *Cupido*, for most of the "blues," some 300 species, including all those in Schrank's sect. B. Scudder's statement in 1875 (*Historical Sketch*, p. 149) that "*Cupido* may be retained for the group represented by the first two species of the second section, with *arion* for type, is clearly barred by Kirby's action five years earlier, and, on this ground, we accepted *alsus* = *minimus* as type, in 1896 (*Brit. Butts.*, pp. 156, 160). In 1881, Moore described a group of small Indian Plebeiid Lycænids, under the name of *Zizera* (*Lep. Ceylon*, i., p. 78), his diagnosis agreeing with the Indian species, but he curiously named *minimus* the type of the genus, although this species is quite different in its neuration and genitalia. It is clear that the generic name and description must go with the group of Indian species described under it, and not to *minimus*, which belongs to an entirely different tribe. Evidently Kirby later regretted his action of 1870, in selecting *alsus* (= ♀ *puer*), for, besides altering the type of *Cupido* from *alsus* (♀ *puer*) to *argiades* (♂ *puer*) (*Handbook*, &c., p. 85), he uses Moore's name *Zizera* for *minimus* (*op. cit.*, p. 105), but these changes are evidently as unallowable as they are undesirable, and *Cupido* must be retained for the group that has *minimus* for type.

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[*] *Hippothoë* = *rutilus*, and *chryseis* = *hippothoë*.

The actual alliance between *Everes* and *Cupido* appears to be a very close one. Superficially it would appear that *Binghamia* (*parrhasius*) is much nearer *Everes* (*argiades*) than is *Cupido* (*sebrus* and *minimus*), but the ancillary appendages suggest that the converse is the case, *Cupido* (*minimus*) being, at least in this particular, very much nearer to *E. argiades* than are *Binghamia* (*parrhasius*), and

Tongeia (*fischeri*) the latter being still further removed from *Cupido* than *Binghamia*. For the genitalic characters of the genus *Cupido* see *anteà* p. 43.

Cupido minimus, Fuessly.

Synonymy.--**Minimus**, Fuess., "Verz.," p. 31 (1775); Esp., "Eur. Schmett.," i., pt. i., p. 338 (1779), pl. xxxiv. (supp. x.), fig. 3 (1777); Goeze, "Ent. Beit.," p. 68 (1780); Schneid., "Syst. Besch.," p. 270 (1787); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 75 (1789); Auriv., "Bihang till Handl.," pp. 23, 26 (1880); Kane, "Eur. Butts.," p. 50 (1885); Meyr., "Handbk.," etc., p. 345 (1895); Staud., "Cat.," 3rd ed., p. 89 (1901); Lamb., "Pap. Belg.," p. 243 (1902). **Alsus,** Fab., "Mant. Ins.," ii., p. 73 (1787); Lang, "Verz.," 2nd ed., p. 58 (1789); Brahm, "Ins. Kal.," p. 310 (1791); Fab., "Ent. Syst.," iii., pt. 1, p. 295 (1793); Bork., "Rhein. Mag.," i., p. 285 (1793); Don., "Brit. Ins.," ix., p. 73, pl. 322, fig. 1 (1795); Lewin, "Ins. Gt. Brit.," i., p. 82, pl. xxxix., figs. 3-4 (1795); Hb., "Eur. Schmett.," pl. lviii., figs. 278-9 (1796); text, p. 46 (*circ.* 1805); "Raup.," etc., i., pl. xxxiv., figs. *c-d* (*circ.* 1800); Ill., "Schmett. Wien.," ii., p. 268 (1801); Haw., "Lep. Brit.," p. 40 (1803); Hoffmansegg, "Ill. Mag.," iii., p. 185 (1803); Herbst, "Nat. Syst. Ins.," xi., p. 190, pl. cccxi., figs. 4-5 (1804); Panzer, "Sch. Icones Ins.," p. 151 (1804); Latr., "Nat. Hist. Crust.," xiv., p. 121 (1805); Ochs., "Die Schmett.," i., pt. 2, p. 22 (1808); Latr., "Gen. Crust. Ins.," iv., p. 207 (1809); Oken, "Lehrb.," p. 719 (1815); Leach, "Edin. Encycl.," ix., pt. 1, p. 130 (1815); Dalm., "Handl.," p. 96 (1816); Ochs., "Die Schmett.," iv., p. 25 (1816); Hb., "Verz.," p. 69 (1816-18); Latr., "Enc. Méth.," ix., p. 617 (1819); Sam., "Ent. Comp.," p. 242 (1819); Godt., "Enc. Méth.," ix., p. 704 (1819); "Pap. Fr.," ii., p. 203, pl. xxvi., 5-6 (1821); Curt., "Brit. Ent.," fo. 9 (1824); Stphs., "Illus.," i., p. 86 (1828); "Ins. Cat.," 1st ed., p. 22 (1829); Bdv., "Eur. Lep. Ind.," p. 13 (1829); Meig., "Eur. Schmett.," ii., p. 8, pl. xlvi., figs. 5*a-c* (1830); Dup., "Pap. Fr.," supp. i., p. 390 (1832); Treits., "Die Schmett.," supp. x., p. 65 (1834); Stphs., "Illus.," iv., p. 404 (1834); Ramb., "Faun. And.," p. 269 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 62 (1839); Bdv., "Gen. et Ind. Meth.," p. 13 (1840); Zett., "Ins. Lapp.," p. 912 (1840); Westw., "Syn. Gen.," p. 88 (1840); Humph. and Westd., "Brit. Butts.," p. 100, pl. xxxi., figs. 4-8 (1841); Neust. and Korn., "Schmett. Schles.," p. 45, pl. 20, figs. 67*a-c* (1842); H.-Sch., "Sys. Bearb.," i., p. 117 (1843); Evers., "Faun. Volg.-Ural.," p. 47 (1844); Dup., "Cat. Méth.," p. 31 (1844); Stphs., "List," 1st ed., p. 19 (1850); Heydrch., "Lep. Eur. Cat.," p. 13 (1851); West. and Hew., "Gen. Diurn. Lep.," ii., p. 492 (1852); Led., "Verh. zool.-bot. Gesell.," i., pt. 2, p. 19 (1852); Wallgrn., "Skand. Dagft.," p. 237 (1853); Stphs., "List," 2nd ed., p. 17 (1856); Sta., "Man.," i., p. 58 (1857); Ramb., "Cat. Lep. And.," p. 42 (1858); Speyr., "Geog. Verb. Schmett.," i., p. 248 (1858); Dbld., "Syn. List," 2nd ed., p. 2 (1859); Hein., "Schmett. Deutsch.," i., p. 74 (1859); Wilde, "Pfl. und Raupen," ii., p. 45 (1860); Staud., "Cat.," 1st ed., p. 6 (1861 ; Kirby, "Man.," p. 110 (1862); Gärt., "Berl. Ent. Zeits.," p. 115 (1865); Berce, "Faun. France," i., p. 147 (1868); Nolck., "Lep. Fn. Estl.," i., p. 57 (1868); Butl., "Cat. Diurn. Lep.," p. 169 (1869); Newm., "Brit. Butts.," p. 134, fig. 46 (1871); Mill., "Cat. Lép. Alpes-Mar.," p. 104 (1872); Kirby, "Syn. Cat.," p. 371 (1871); Cuni-y-Mart., "Lep. Barcel.," p. 19 (1874); Scudd., "Hist. Sketch," p. 228 (1875); Frey, "Lep. Schweiz," p. 21 (1880); Buckl., "Larvæ, etc.," i., p. 100, pl. xiv., fig. 2-2*e* (1886); Dale, "Brit. Butts.," p. 58 (1890); de Nicév., "Butts. Ind.," iii., p. 111 (1890); Barrt., "Lep. Brit. Isl.," i., p. 92, pl. xiv., figs. 1-1*c* (1893). (?) **Minutus,** Esp., "Schmett. Eur.," pl. cvi., fig. 8 (1787); i., supp. p. 71 (1797?). **Pseudolus**, Bergs., "Nomen.," iii., p. 5, pl. l., figs. 5-6 (1780); Bkh., "Sys. Besch.," i., pp. 177, 284 (1788); ii., p. 235 (1879); Scriba, "Jour.," iii., p. 239 (1791). **Puer** ♀, Schrank, "Fauna Boica," ii., pt. 1, p. 215, ♀ (1801). **Minima,** Snell., "De Vlind.," i., p. 58 (1867); Staud., "Cat.," 2nd ed., p. 13 (1871); Bang-Haas, "Nat. Tids.," ix., 3rd ser., p. 394 (1874); Curò, "Bull. Soc. Ent. Ital.," vi., p. 113 (1874); Kirby, "Eur. Butts.," i., p. 46, pl. xiv., fig. 3 (1882); Lang, "Butts. Eur.," i., p. 128, pl. xxxi., fig. 3 (1884); Lampa, "Ent. Tids.," vi., p. 15 (1885); Auriv., "Nord. Fjär.," p. 15, pl. vi., fig. 3 (1888-91), Leech; "Butts. China," ii., p. 323 (1894); Rühl, "Pal. Gross-Schmett.," i., p. 295 (1895); Tutt, "Brit. Butts.," p. 160, pl. ii., fig. 10 (1896); "Ent. Rec.," vii., pp. 220, 300 (1896); Reut., "Ent. Rec.," x., p. 97 (1898); Kirby, "Handbook," etc., ii., p. 105, pl. xlix., figs. 4-5 1896); Grote, "Schmett. Hildesh.," p. 42 (1897); Fleck, "Macr.-Lep. Rüman.," p. 22 (1901); Wheel., "Butts. Switz.," p. 24 (1903); South, "Brit. Butts.," p. 176, pl. cxiv.-cxv., figs. 1-8 (1906).

PLATE XLIX.

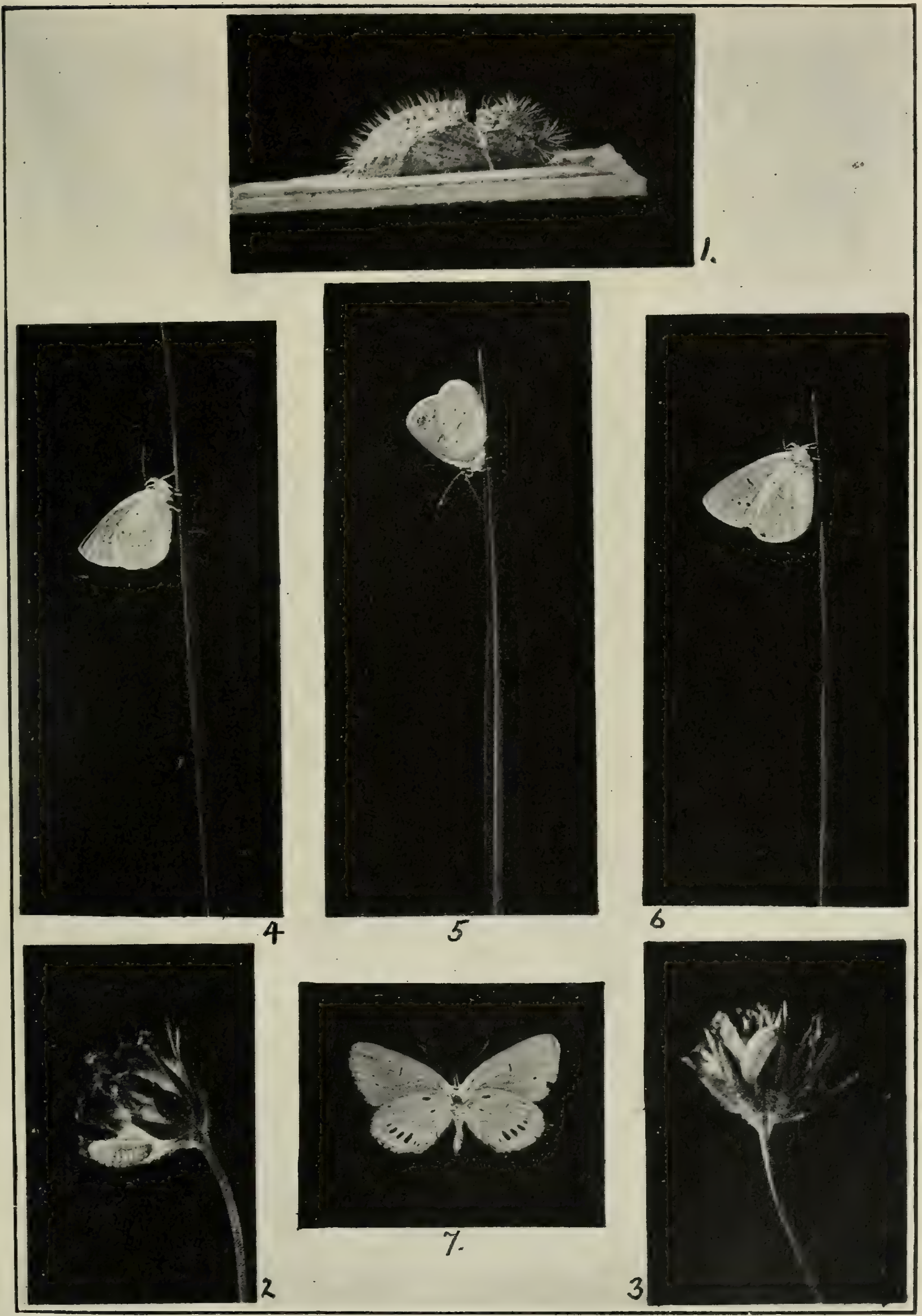

Photo. H. Main.

EVERES ARGIADES (FIG. 1, PUPA-SKIN × 3),
CUPIDO MINIMUS (FIGS. 2-3, LARVÆ, AND FIGS. 4-7, IMAGINES, NAT. SIZE).

A Natural History of the British Butterflies, etc., 1909.

Original description.—*Papilio minimus*, Schaeff., *Ratisb.*, t. 165, f. 1-2. The smallest of the known butterflies. The wings above are quite uniform blackish-brown; underneath, grey, with a band of black spots as in the foregoing species (*argiolus*); that this is not the same as *argiolus* of Linné, is evident from the black-brown colour of the wings on the upper surface, in distinction to this, the colour of the previous species (*argiolus*) is blue, with a black border. Not uncommon with us in roads near woods (Fuessly).

Imago.—19mm.-24mm. Ground-colour, dark fuscous, sometimes inclining to blackish. ♂ sprinkled with light blue scales at base and towards the disc of the wings; ♀ uniform blackish-fuscous. The underside bluish-grey, with well-defined discoidal and submarginal transverse row of black dots ringed with white; hindwings also with discoidal, basal and submarginal row of dots similarly ringed.

Sexual dimorphism.—The ♂ is generally to be distinguished from the ♀ by the scattering of bluish scales, towards the bases of the wings, on the upperside; the ♀ being entirely blackish-fuscous. The androconia have particularly concave edges and less elongated bases than have those of *Cyaniris semiargus*, so that they are very much rounded, in fact, sometimes circular; length, without stem, 0·054mm., width, 0·04mm.; there are about 12 rows of dots across each (Aurivillius). Pierce describes (*in litt.*) the scales of the ♂ as follows:—"(1) The transparent scales ·0035in. × 0015in., pinky, deeper at the apex, generally an elegantly-shaped scale, widest at the apex, sometimes with three very evenly rounded lobes, the central one being slightly longer. (2) Darker scales, ·003in. × ·001in., two- and three-pointed, wider at the apex. (3) Underside scales four-pointed. (4) Androconia, ·0015in. × ·001in., nearly round, each with twelve rows of about eleven spots, joined by a fine connecting-line. The ♀ scales are:—(1) Dark scales, bluntly four-pointed. (2) Some slightly wider and much shorter scales, with uneven apex, one side as a rule being longer than the other. (3) Underside scales bluntly four-pointed. [The transparent scales on the upperside are, of course, absent in the ♀.]

Variation.—The variation of this species is less striking than that of most of its allies, yet it shows a considerable range in tint, size, and the spotting of the underside. The ♀ s are much darker than the ♂ s, which are sometimes quite plentifully sprinkled with blue scales; the ground colour varies from pale grey to black, in both sexes it usually inclines to greyish-fuscous, the ♀ less suggestively grey than the ♂, whilst, in others, the greyish tint decreases, until, in the most extreme forms, the colour is quite black; some ♀ s are very distinctly brown. Of individuals of unusual ground colour, Dale records an "albino" taken at Winchester, and Goldthwaite a xanthic example taken at West Horsley (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 51). Not only is there considerable difference in the quantity of blue scales in the ♂, but also in their tint, some being green rather than blue (=ab. *viridescens*, n. ab.), whilst, of the latter, some are distinctly violet-blue (=ab. *violascens*, n. ab.), others bright pale blue (=ab. *caerulescens*, n. ab.); the most violet-blue ♂ s observed come from Spain (Leech coll.), Airolo (Godman), Bergün (Zeller). In Britain, the colour of the upperside of the ♂ appears to be subject to local variation, the suffusion of blue being particularly strong in examples from the north and west of Ireland (*Ent. Rec.*, ii., p. 299). Bankes says that, in Dorset, both sexes show great variation in size, whilst some of the ♂s are much more thickly powdered with silvery-blue scales than others, and these blue scales are always more numerous on the fore- than on the hindwings. Dennis has recorded the capture of exceptionally blue-powdered examples at Horsley, and Adkin observes that, in 1904, the ♂s taken at Eastbourne, are exceptionally strongly blue-scaled, suggesting a seasonal difference here, whilst Main notes that those taken at Folkestone the same year exhibited considerable variation in this respect (*Proc. Sth. Lond. Ent. Soc.*, 1905, p. 70). As to local variation, Wilkinson states (*in litt.*) that the ♂s from Gelt and the Newbiggin Woods are very much bluer than the Wreay ones, whilst Main also notes large specimens from Cumberland (*Ent.*, xxxv., p. 327). Wocke records (*Stett. Ent. Ztg.*, xxv., p. 175) the Scandinavian examples captured at Hamar am Mjösen, as being quite similar to the German specimens, only the ♂s somewhat more richly dusted with blue on the upperside. Rebel notes (*Lep. Balkans*, p. 186) that the coloration of the Bosnian and Hercegovinian examples is dark brown, the ♂s most strongly dusted with blue towards the base of the wing, the black spots on the underside strongly developed, and adds that these large specimens have often erroneously been referred to *sebrus* (*del.* Homeyer). Fuessly's original description is of an uniform fuscous form, possibly, therefore, a ♀, and this appears to be so also with the Fabrician *alsus*, but Hübner's *alsus* (fig. 279) shows slightly the blue scaling at the bases of the wings characteristic of the normal ♂. Aigner-Abafi records breeding very large, deep black, examples from larvæ found feeding in the pods of *Colutea arborescens*, but others bred by Szépligeti, from larvæ on seed-heads of *Sanguisorba*, were quite normal. The ♂s of the Thibetan and Mongolian race var. *magna*, Rühl, judged by the examples in the British Museum coll., are without blue scaling; the specimens from the Altai are strongly blue-scaled. In size, there is also great difference, the examples from the high Alps, where the species is almost certainly only single-brooded, being much larger than normal, whilst Nicholson also notes a large example from Bodö, within the Arctic Circle, and specimens from this locality in the British Museum coll. are of good size. The specimens from the Ural, the Altai, etc., are also large. Barrett says that the variability in size in British examples is such that "some specimens are not much more than half the normal dimensions," but we have never seen anything so small as half the normal size, although Esper's figure of the tiny ab. *minutus*, by some considered doubtfully referable to this species, is exceedingly small. Reverdin observes that the largest of 80 examples in his collection measures 25·5mm. from wing-tip to wing-tip (the same example 27mm. from wing-tip to centre of thorax × 2), whilst the smallest measures 17mm. from wing-tip to wing-tip (and 18mm. by doubling distance from the centre of the thorax to apex of wing). Blachier says that the normal size of specimens in the Geneva district is about 20mm., but he notes an example (from the Salève) measuring only 15mm., whilst others from the same locality measure 25mm.-26mm., and yet others from the Alps (of the form *alsoides*) expanding 26mm.-27mm., Rehfous also notes a specimen from Geneva as small as 15mm. Grund states that, in Croatia, the wing-expanse varies from 19mm.-25mm. Weir records that British examples in his collection varied from 17mm.-22mm., Edgell observes a small one captured in the

Lewes district, measuring 8½ lines (just under 18mm.) in expanse. The average Asiatic examples appear to be somewhat larger than the European. Rühl has named the Thibetan race var. *magna*, but, judged from the specimens in the British Museum Coll., these are hardly so large as those from several other localities, *e.g.*, those from the Altai, Urals, etc. Graeser observes (*Rom. Mém.*, vi., p. 164) that the Amurland examples are always larger, the underside paler blue-grey, with larger black spots than in the usual European examples, and further states (*Berl. Ent. Zeits.*, xxxii., p. 80) that, whilst the European examples measure from 21mm. to 24mm., those from Amurland measure from 25mm. to 29mm. Staudinger, writing of the specimens from the Kentei mts., says (*Iris*, v., p. 319) that they mostly measure 25mm., are somewhat larger than the usual *minimus*, although they do occur just as large and larger in Europe; the ♀ s are quite dark on the upperside. Alphéraky notes (*Rom. Mém.*, ix., p. 319) that four ♂ specimens from Kamschatka, taken in June and July, measured from 24mm.-26mm.; the undersides very bright, the uppersides dark, without any blue scaling in three of the specimens, a weak bluish tint only in the 4th at the base of the forewings. The Urals give a fine large race, fully as large, or larger than var. *magna*, and scaled heavily with blue in the ♂ s; on the whole these seem to agree with the large alpine form, known as var. *alsoides*, Anderegg. The var. *howkowi*, is also a large form, the ♂ s heavily scaled with blue, but differing from all other varieties on the underside. Leech observes that Chinese specimens are rather larger than European examples, the ♂ s uniformly dark bluish-grey, and the ♀ s rather more shining-black; on the underside the ground colour is more bluish-white than in European specimens, agreeing in this respect with *C. sebrus*; the black spots on the underside are more or less absent. Certainly those from How-Kow are the largest examples of the species in the British Museum coll. Rebel calls the specimens from Bosnia and Hercegovina very large, and says they sometimes expand as much as 24mm.; he further observes that, on July 22nd, 1892, he saw some specimens at Renglstein, with a wing-expanse of more than 22mm., evidently, he adds, the larger form observed by Christ (*Verh. d. naturw. Ges. in Basel*, viii., p. 129). The ordinary, not racial, examples of large size, *i.e.*, more than 24mm. we call ab. *major*, n. ab., those less than 19mm., we call ab. *minor*, n. ab. Even if Esper's small *minutus* be referable to the species its peculiar fringe makes it a most unusual aberration. The undersides show considerable variation in ground colour, as well as in the size and number of the spots. Some examples are almost spotless (=ab. *obsoleta*), whilst, in very rare cases, the spots are elongated as small dashes (=ab. *striata*, n. ab.). Certain districts appear to be more subject to this underside variation than others, for Wilkinson states (*in litt.*) that the Cumberland examples vary considerably in the undersides, some being spotless, others much streaked and spotted. Dennis exhibited specimens from Horsley, showing a complete gradation from an example almost without spots on the underside to one having large and well-developed spots (*Proc. Sth. Lond. Ent. Soc.*, 1896, p. 52); similarly, Turner showed six examples from Galway, presenting a graduated series in the development of the spots on the underside, from one with full set of well-developed spots to one with only a trace of markings besides the discoidal spots on the forewings (*op. cit.*, 1894,

p. 50). The normal number of spots in the median series of the underside of the forewing is seven, and in that of the hindwing nine; the spots being counted from the costal edge to the anal angle 1, 2, 3, 4, 5, 6, 7, and 1, 2, 3, 4, 5, 6, 7, 8, 9 respectively. There is sometimes a vague trace of a hind-marginal series of compound spots, often fairly distinct in British examples. The median row on the forewings sometimes numbers eight spots, the supplementary spot being found on the costa. Those examples with the normal number of spots exceptionally large and well-developed we call ab. *magnipuncta*, n. ab.; those with the normal number, but very small, and the marginal rings usually lost in the ground colour, we call ab. *parvipuncta*, n. ab. In the obsoletely-marked examples those spots nearest the costa seem to disappear first—becoming 6, 5, 4 and 3 in this direction on the forewings. Those of the hindwings frequently disappear by a general reduction of all the spots to vanishing point, those of the forewing remaining normal or nearly so = ab. *semiobsoleta*, n. ab. Pickett records (*Proc. Sth. Lond. Ent. Soc.*, 1902, 144) an example in which the spots on the underside of the right pair of wings are obsolete, those of the left pair being normal. The extreme form, *i.e.*, that on which all the spots except the discoidals are wanting, are very rare = ab. *extrema*, n. ab.; Dennis records one from Horsley, and a similar ♀ is recorded (*Ent. Ver. Dresd.*) as being taken near Dresden, the underside being entirely without ocellated spots. Another very important feature in the underside spotting is also noticeable, *viz.*, that, instead of the submedian transverse row of spots being arranged in continuous series across the underside of the forewings, an occasional specimen has the two lowest ones, those nearest the inner margin, strikingly placed out of line from the rest of the series, forming the bent row (une marche d'escalier) that so characteristically separates *Everes alcetas* from *E. argiades*; this form we call ab. *alcetoides*, n. ab.; specimens labelled "England" and "Jena" are in the British Museum coll., and Blachier records a similar one from the Mont Salève. The little black marginal point, near the anal angle of the hindwings beneath, situated in cellule 2, just inside the fringe, is very strongly marked in some Alpine examples, and is the characteristic feature in Bergsträsser's figure of the ab. *pseudolus*. The most striking underside of all the local races of this species is that of var. *howkowi*, which is white and almost spotless, and again reminds one somewhat of the parallel underside of *Everes amyntula*. The following appear to be the chief named forms:—

(?) α. ab. *minutus*, Esp., "Eur. Schmett.," i., supp. p. 71, ii., pl. cvi. (contd. lxi.), fig. 8 (1787); Heydrch., "Cat.," p. 13 (1851).—*P.P.R. minutus*.—Alis ecaudatis, suprà atro-cæruleis, ciliis nigro-alboque tesselatis crenatisque; subtus cinereo cærulescentibus, omnibus ocello medio unico, marginalibus quinis. We had hitherto regarded *Papilio minimus* and *tiresias* as the two smallest European butterflies, but now one of this very aberrant genus has occurred of even smaller size. The butterfly here figured is sufficiently distinct from *P. tiresias*, it has neither the ocellations nor the hair-like process at the anal angle of the hindwings; it comes, however, nearer to *minimus*. Still, in this case, the upperside is more decidedly overlaid with blue, in the other (*minimus*) it is more mixed with the grey. The outer margin of the forewing is more rounded, and is edged with a border (*i.e.*, fringe) of alternate black and white, which is cut out in the shape of a hood, the black standing out prominently in the rounded indentations. *P. minimus* has, on the other hand, even fringes of an unicolorous grey or blackish.

The underside of both wings is of a lighter grey, with a stronger admixture of blue towards the base, and the outer margin has white fringes, whilst, in the other (*minimus*), they are unicolorous with those of the forewing.* In the centre of each wing is a single black, white-ringed eye-spot, somewhat long in shape; at the hind margin is a row of very small eye-spots, without pupils, running parallel with it, five on each wing, in close proximity to one another. *P. minimus* has several, forming a row in a more sloping direction; it has also two at the base, which, in the present insect, are wholly wanting. This would be a sufficient distinction in creatures so small and so closely related. This butterfly was found two years ago in the neighbourhood of Turnau, in the month of August; one single example only. A much valued friend, Herr Hoffmann, the artist, had himself discovered it, and communicated the information to me as a welcome contribution, together with other important observations. The butterfly is in excellent preservation, and remains in his possession as an unique rarity (Esper).

Our own note on this form reads: In spite of Esper's description of the fringe of the forewings being latticed with black and white, his figure appears to be a very small example, measuring 13 mm., of *Cupido minimus*. At any rate it is quite aberrative in its fringe-structure and the name cannot stand for small specimens of normal appearance.

β. ab. *pallida*, Tutt, "Brit. Butts.," p. 161 (1896); Wheeler, "Butts. Switz.," p. 24 (1903).—A rare aberration of the ♂, in which the ground colour is of a pale grey tint (Tutt).

The type of this form came from the South Foreland, in Kent, but it is distributed, though rare, for Blachier (*in litt.*) informs us of a ♂ with grey upperside, taken on the Salève, in May, 1890. We have a note that a large, pale, and very grey ♂ from the Kentei mts., captured by Dörries, is in the Brit. Mus. coll.

γ. ab. *obsoleta*, Tutt, "Brit. Butts.," p. 161 (1896); Wheeler, "Butts. Switzd.," p. 24 (1903); Grund, "Int. Zeits. Gub.," p. 87 (1908). *Simplex*, Aign.-Abafi, "Rovart. Lapok," vii., p. 144 (1900).—An underside aberration with the spots almost or quite obsolete (Tutt).

Aigner-Abafi gives almost the same description as ourselves, *viz.*, "beneath with only 2, 3, or no eyespots at all." We have already isolated the absolutely spotless form (except for the discoidal spots) as ab. *extrema* (*anteà*, p. 108), and retain the name *obsoleta* for the variable examples with most of the spots obsolete. Dahlström describes the species as very variable as regards the number of spots at Eperjes, and adds that he has taken examples which exhibit on the underside only 2 or 3 or even no ocellated spots at all. Leonhardt refers a ♂ specimen to *obsoleta*, Tutt, and describes (*Ent. Zeits.*, xviii., p. 54) it as having all the spots of the median row absent on the underside of the hindwings, whilst of the basal spots only that in cell II_1-II_2 of the right forewing is present. On the forewings the spots in cell II_5-III, and III_1-III_2 are absent. The specimen was taken at the Castle of Dorneck near Dornach (Canton Solothurn) on May 14th, 1904. Reverdin states (*in litt.*) that of 80 specimens of this species in his collection three only have the spots fewer than the normal number, *viz.*, (1) ♂. Taken in the Laquinthal, August 3rd, 1903: Right forewing—spot 1 wanting. Left forewing—spots 1 and 2 wanting. Right hindwing—spots 1, 2, 3, 4, 6, 7 and 8 lacking. Left hindwing—spots 1, 2, 3, 4, 6, 7, 8 and 9 lacking. The basal spots absent on both sides. (2). ♂. Taken in the Laquinthal, July 10th, 1907: Right and left forewings normal. Right and left hindwings—spots 5 and 6 wanting. The basal spots also wanting. (3). ♂. Taken at Arolla, July 15th, 1906. Right and left forewings—spot 1 lacking. Right hindwing—spots 2, 5 and 6 lacking. Left hindwing—spots 2, 5, 6, 7 and 8 lacking. The basal spots small but not altogether absent. Grund records a ♂ taken at Pontused, May 23rd, 1906, in which only two spots on the inner margin of the forewing remained. Turner records (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 50) a specimen with only a trace of markings beside the discoidal spots on the upper wings, captured in Galway; Dennis exhibited an example from Horsley almost without spots on the underside of the wings (*op. cit.*, 1896, p. 52); Robinson a similiar one one (*op. cit.*, 1902, p. 105), taken at Swanage in July 1902, whilst Wilkinson notes (*in litt.*) exactly similar examples from Cumberland. Zeller states (*Stett. Ent. Ztg.*, 1877, pp. 293-4) that, at Bergün, the eyespots on the underside vary in size; one ♂ with comparatively small spots on the forewings, has, on the hindwings, on the costa towards the base, one small spot, and besides only two still smaller ones between the discoidal spot and the hind-margin.

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* This is obscure, the *forewing* being apparently contrasted with the *upperside;* in the plate the forewing has chequered, the hindwing whitish, fringes on both sides.

δ. ab. *semiobsoleta*, n. ab.—With the spots on the underside of the forewings present, but those usually present on the underside of the hindwings entirely absent. A specimen in the Brit. Museum Coll.

Blachier also notes (*in litt.*) a precisely similar example captured at Geneva; the 7 normal spots on the forewings being well-marked, whilst those of the hindwings are quite obsolete.

ε. ab. *striata*, n. ab.—The submarginal series of spots on the underside of the hindwings elongated into dashes or streaks of considerable but varying lengths. This streaked form is noted as being exhibited at the meeting of the South London Entom. Society, November 23rd, 1905, by Mr. Joy (*Proc. Sth. Lond. Ent. Soc.*, 1905, pp. 92, 100).

ζ. ab. *pseudolus*, Bergstr., "Nom.," iii., p. 5, pl. 1., figs. 5-6 (1779).—*P.P.R.* alis rotundatis integerrimis fuscis, subtus cinereis punctorumque ocellarium solitario arcu, praeter unum in [disco] anticarum, ternosque in posticarum ocellos. Wings rounded, uniform brown, beneath ashy-blue, with a single arcuate row of ocellated spots, in addition one little eyespot in the middle of the forewing, and three in the hindwing. Herr Esper has erred in the naming of this little butterfly, as I have already remarked above (Bergsträsser).

Bergsträsser's fig. 5 shows the upperside of an uniform fuscous-black colour, except the extreme base which is tinged with blue. His fig. 6 exhibits a very strongly-spotted form of the underside, the ground colour blue-grey; the forewings with six spots in transverse series and the discoidal, all ringed with white; the hindwings with the discoidal spot, a transverse arcuate row of seven spots, two basal spots, and one spot on the outer margin at the anal angle, also edged with white. The outer marginal spot at the anal angle (in the same position as the lower orange spot in *argiades*) very marked. The combined characters of this aberration, the blue-grey ground colour, strongly-marked, white-margined spots, and the highly-developed anal marginal spot of the hindwings, on the underside, are sufficiently striking. Blachier notes (*in litt.*) the development of this anal spot as being specially strongly marked in some Alpine examples, particularly in some he obtained in the Val Piora in July, 1907.

η. var. *alsoides*, [Anderegg,] Bdv., "Gen. et Ind. Meth.," p. 12 (1840); Meyer-Dür, "Schmett. der Schweiz," pp. 91-2 (1851); [Gerh., "Mon. Schmett.," p. 9, pl. xiii., figs. 3*a-c* (1853);] Rühl, "Pal. Gross-Schmett.," i., p. 766 (1895); Tutt, "Brit. Butts.," p. 161 (1896); Favre, "Lép. Val.," p. 23 (1899); Wheeler, "Butts. Switz.," p. 24 (1903).—Besides considerable variation in size, this species also shows, even in the same localities, sometimes more and sometimes less blue scaling.

Geognostic influences have a remarkable effect upon it, *e.g.*, all my Alpine specimens have the hindwings more rounded off, and wider than those from the Jura. In the Valais, a much larger form of the butterfly appears, which is also characterised by the strong blue scaling at the base of the upperside of the wings = *alsoides*, Anderegg (Meyer-Dür).

The name is generally referred to Anderegg, but we are quite unable to trace any description to this entomologist, and it was presumably a MS. name under which Anderegg distributed the species. Boisduval simply says "var. ? *alsoides*, Andgg., Valesia." Meyer-Dür appears first to have diagnosed it, and then Gerhard noted, in 1853, that *alsoides*, Andgg., was an interesting variety of *alsus*, discovered by Anderegg, at Gamsen, described by Boisduval, and chiefly distinguished by its size. His figures (pl. xiii., figs. 3*a*-*c*) are especially unsatisfactory, the blue being of an almost impossible shade in this species, and the so-called ♀ more strongly blue-coloured than the so-called ♂. Rühl mentions it as "a very large form, with strong blue scaling at the wing bases on the upperside," whilst Wheeler describes it as "showing a still further increase of size without more blue (than var. *montana*) in the ♂, 26mm. and above, found in the highest alps, *e.g.*, the Simplon Pass, Pierre-à-voir-sur-Saxon, Glacier de Trient (Favre), Laquinthal (Rätzer), Mürren, August 2nd," etc. (Wheeler). His statement that the form is "without more blue in the ♂," and the fixing of a definite minimum size, are not in accordance with Meyer-Dür's description. Favre gives a more correct diagnosis, "much larger, with the disc of the wings bluish." Wheeler elsewhere (*Ent. Record*, xi., p. 314) notes that splendid examples of this aberration occur near the sixth refuge on the Simplon Pass, above Bérisal; and (*Ent. Rec.*, xvi., p. 13) that he found it, on July 13th, 1903, in the Laquinthal of large size, the largest measuring 29mm. Rehfous notes (*in litt.*) that the individuals he has captured in the Laquinthal have had a mean wing-expanse of 25mm. (the smallest individual 21mm., the largest 27mm.). Zeller observes (*Stett. Ent. Ztg.*, 1877, pp. 293-4) that what Meyer-Dür says of the variation in the size of this species, and in the bluish dusting of the wings, applies also to the examples taken at Bergün; two ♂s taken there are as large as the smallest *semiargus*. Sheldon records this form from Digne, May 2nd and 3rd, 1905, and Lowe, above Santa-Maria, near Susa, June 16th-21st, 1902. [Glaser erroneously referred the little ab. *minutus* to the var. *alsoides* of Anderegg and Gerhard. Piffard, an English collector, recorded (*Ent. Rec.*, xiv., 288) some quite ordinary specimens from Lymington, under this name, and later offered them for sale. The specimens were certainly not the alpine form.]

θ. var. *montana*, Favre, "Lép. Valais," p. 23 (1899); Wheeler, "Butts. Switz.," p. 24 (1903). *Alsoides*, Staud., "Cat.," 3rd ed., p. 89 (1901).—*Montana*, Frey, ♂ and ♀ larger, strongly grey-green, with the spots on the underside often larger. On the roads, in the pasturages of the alpine region, on the Simplon (Favre).

Favre referred (*Macro-Lep. du Valais*, p. 23) this name to Frey, but the latter certainly never described a form of *minimus* as *montana*. He wrote (*Lep. Schweiz*, p. 21) in his description of *alsus*: "Common in the Alps, appearing first at considerable heights, in July and August. One finds here, not rarely, single unusually large specimens thickly dusted with blue." This no doubt refers to *alsoides*, which Favre also mentions. One suspects, therefore, as the name *alsoides* has been so generally used for the Swiss mountain form, that Favre was under some erroneous impression as to Frey having named specially the mountain specimens with greenish-blue scaling, and the name *montana* appears, therefore, to have originated with himself. The form as described by Favre, merely differs from *alsoides* in that the usual blue scales of the latter are, in this, greenish. It is evidently Staudinger's *alsoides*, as he notes (*Cat.*, 3rd ed., p. 89) the colour at the base of the wings as "valde viridescens." Höfner notes (*Schmett. Kärntens*, p. 223) that "examples covered with greenish-blue scales at the base of the upperside of the forewings, are found everywhere with the type in Styria." Wheeler describes *montana* as "24mm.-26mm.; an increase of greenish-blue scales on the upperside in the ♂; the eye-spots of the underside often larger; occurring generally, in moderately high localities, but also a very usual form on the slopes above Lavey, *e.g.*, in May and June, 1902."

ι. var. *magna*, Rühl, "Pal. Gross-Schmett.," i., p. 766 (1895); Tutt, "Brit. Butts.," p. 161 (1896); Staud., "Cat.," 3rd ed., p. 89 (1901).—Very large, above wholly uniform black-brown in colour (almost black), without the least trace of any blue scales. From Thibet, Kuku-noor (Rühl).

Rühl ascribes the name to Staudinger, and Staudinger to Rühl; most probably it originated as a MS. name in Staudinger's price lists. Staudinger describes this race from Central Asia (*Cat.*, 3rd ed., p. 89) as "permagna supra unicolor nigrescens, vix nominanda." Our own description in *Brit. Butts.*, p. 161, is not quite accurate, in suggesting that there may be some blue scales, which is not the case on the original description. There is a nice series in the Brit. Mus. coll., and we should merely call it a moderately large race, the specimens coming from Mongolia and Thibet, and are labelled Urga, Irkut, Changai mountains, and Amdo. With the exception of the specimen from Urga, none of the examples have any trace of blue scaling; on this, however, under a lens, one detects blue scales towards the base of the forewings; it appears, nevertheless, to be of the same racial form.

κ. var. *howkowi*, n. var.—Very large; ♂ well-scaled with blue basally and on disc; ♀ dark fuscous. Underside particularly white, with ill-developed spots (the ♂ in the Brit. Mus. coll., has none except the discoidal of the forewing). How-Kow, Ta Chien Lu (Pratt and Leech coll.).

This race, from extreme eastern Thibet and western China, is one of the best-marked races represented in the fine series of this species in the British Museum collection, being characterised not only by its exceptional size, but also by its very remarkably pale and ill-marked underside.

λ. var. (an spec. dist.) *lorquinii*, H.-Sch., "Sys. Bearb.," vi., p. 25, figs. 442-444 (1852); Gerh., "Mon. Schmett.," p. 9, pl. xiv., figs. 3*a-c* (1853); Kirby, "Syn. Cat.," p. 372 (1871); Staud., "Cat.," 2nd ed., p. 13 (1871); [Sand, "Lep. Ber. Auv.," p. 7 (1879);] Staud., "Stett. Ent. Zeit.," xlii., p. 284 (1881); Lang, "Butts. Eur.," p. 129, pl. xxxi., fig. 4 (1884); Kane, "Eur. Butts.," p. 50 (1885); Walker, "Trans. Ent. Soc. Lond.," p. 374 (1890); [Brom., "Lep. Riv.," p. 42 (1892);] Rühl, "Pal. Gross-Schmett.," i., pp. 296, 766 (1892-5); Tutt, "Brit. Butts.," p. 161 (1896); Staud., "Cat.," 3rd. ed., p. 89 (1901); Wheeler, "Butts. Switz.," etc., p. 24 (1903). *Alsus* var., Ramb., "Cat. Sys. Lep. And.," p. 42 (1858).—Mas, obscure cæruleus, limbo late nigro, fœmina nigrofusca, vix cœruleo-griseo-adsperso; parva. Size and shape of *alsus*, the only distinction consisting in the beautiful dark blue ground colour of the upperside of the ♂, with broad black margin, which is broader than in the very nearly allied *sebrus*. This is distinctly larger, has a lighter, more reddish, blue, and on all the wings beneath much more strongly curved rows of spots. A pair from Herr Keferstein. The female would be difficult to separate from that of *alsus;* the apex and the outer margin of the forewings are more rounded, the fringes longer and greyer, the eyespots of the underside smaller, less connected together, that of cell six of the hindwing not situated near the base (Herrich-Schäffer).

In spite of the contrary opinion of Rambur and Oberthür, whose opinion in this matter is entitled to the greatest consideration, we believe that *lorquinii* is a species distinct from *minimus.* At our request Chapman has made a critical report on the two insects, and notes: "The coloration of the ♂ *lorquinii* on the upper surface is very distinct; the spots beneath are frequently linear, rarely so in *minimus*, and the four spots round the cell of the hindwing are often in a straight line (the only four that ever are so), but then they sometimes are so in *minimus*, and not always in *lorquinii*, whilst the third is often obsolescent in *lorquinii.* In all this underside marking, the variations are the same in both, and any form may be found in both. In the ancillary appendages they are marvellously similar; the only difference that I can find is that the terminal spicular area of the spinous branch of the clasp is thicker and more club-like in *lorquinii*, more tapering in *minimus.* It is usually easy to select one spine as the terminal one in *minimus*, rather difficult in *lorquinii*, several surrounding it (whichever it is) being fairly level with it, but there is considerable variation in this matter in *minimus*, and some are almost of *lorquinii* pattern." This is interesting, but not very definitive. Rambur states (*Cat. Lep. Andalousie*, p. 42) that he "recognises no difference between *lorquinii*, H.-Sch., and *alsus*, Fab.," and concludes that "it is not even a variety; the upperside," he says, "of the male is often of a dull blue, with a very wide black margin, often even invading the greater part of the wings; for the rest, one finds males of *alsus*, of which the underside is in great part blue." We are not clear as to this view of Rambur's, whose opinion is further weakened by the fact that he lumps *sebrus* with *alsus* (*Lep. Fn. And.*, p. 269). To us, *lorquinii* exhibits most distinct racial characters, not approaching at all the various varietal forms found in undoubted *minimus*, the latter occurring in most normal form also in Spain and other countries in which *lorquinii* is found, and in which the latter is supposed to represent typical *minimus.* Thus there are, in the British Museum collection, one quite typical *minimus* labelled "Andalusia, Spain, from Staudinger; Godman coll.," and two others labelled "Spain, Leech coll." The bluish-violet colour of *lorquinii* is very similar to that of *sebrus* or *semiargus*, and not metallic, or silvery, pale blue or green. It gives the idea of an uniform surface, with a dark border, not a mere sprinkling of shiny scales as in *minimus.* In our own opinion *lorquinii* is distinct. Staudinger, in his *Catalog*, 2nd ed., p. 13, treated it as a doubtful variety of *minimus*, but in the 3rd ed., p. 89, as a separate species. The specimens of *lorquinii* in the British Museum collection come from Spain, Algeria, and Morea (see *infrà*). Staudinger writes (*Stett. Ent. Zeit.*, xlii., p, 248) that "Haberhauer unfortunately sent only two fresh small ♀s from Lepsa and the Ala Tau, which might equally well belong to *minimus* or its variety *lorquinii*, as they can only be distinguished in the ♂ sex." He adds that he certainly received a true *minimus* ♂, from the Saisan district, and an equally certain *lorquinii* ♂ from Margelan, in southern Russian Turkestan (there are no Asiatic examples of *lorquinii* in the British Museum collection), so that both ♀s may not at all unlikely belong to the latter form. Oberthür notes (*in litt.*) that he has specimens in his collection as follows:—Spain: Andalusia (ex coll. Boisduval), Granada, June, 1835 (de Graslin), etc. Algeria: Col de Taza, April 18th (Allard), Mecheria, March 19th-30th, 1886, Géryville, May 10th-25th, 1886 (Lahaye), Sebdou, May, 1907 (Powell). [France: Basses-Alpes—Digne, ♂, 1898 (Coulet).] Lang also recorded (*Ent.*, xxxiii., p. 106) two ♂s at Digne, June 19th, 1900, but afterwards (*Ent.*, xxxv., p. 231) stated that they were not true *lorquinii*.* Walker notes it (*Trans. Ent. Soc. Lond.*, 1890, p. 374) as only being met with on one occasion in the Gibraltar district, *viz.*, May 16th, 1887, when he took a few specimens of both sexes in beautiful condition, in a ravine close to the shore of Cabrita Point, about two miles south of Algeciras. Nicholson records a specimen in a damp spot on the road near Huejar, June 4th, 1895, the underside not differing from typical *minimus*, but the upperside as blue as *semiargus*. Staudinger makes (*Cat.*, 3rd ed., p. 89) *buddhista*, Alph., a synonym of *lorquinii*. We have carefully examined Aphéraky's figures (*Hor. Soc. Ent. Ross.*, xvi., 393, pl. xiv., figs. 9-10) of *buddhista*, which are spoken of by the captor as being "very exactly drawn by Mr. Lang," from the two specimens he obtained in the mountains of the Kouldja district, on June 17th, at above 7000ft. elevation, and they certainly leave no room for doubt that this insect is not a form of *minimus* or *lorquinii*. They appear to be, both on the upper- and undersides, much nearer *C. sebrus*, of which he obtained five typical ♂s near Kouldjà and Kounguesse in May and June, and represent, in our opinion, a mountain form of the last named. Chapman, referring to examples from Thian-Shan, and sent from Berlin as, and agreeing absolutely with Alpheraky's figure of, *buddhista*, remarks that, whilst it is really impossible to detect any appreciable distinction between the appendages of *C. minimus* and *C. lorquinii*, those of *C. buddhista* on the other hand present quite abundant points to separate it from these two, even when considered from a quite ordinary point of view; they are, however, practically indistinguishable from those of *sebrus*. There are no Kouldjà (or other) specimens of *buddhista* in the British Museum collection.

μ. var. *moreana*; n. var.—There is, in the British Museum collection, a Morean example of *lorquinii*, labelled "Morea, v., 1900, H. J. Elwes," which, although of the same deep purple-blue ground colour as, is quite different in appearance from, the Spanish examples of *lorquinii* in the same collection, the upperside of all the wings being without the dark marginal border; it is also without a discoidal lunule on the upperside of the forewings, whilst the fringes are white, and the slender black marginal line shows well by contrast; the underside spotting is, however, very similar, except that the two inner of the four usual spots round the discoidal, in the median row on the hindwings, are absent.

EGGLAYING.—The ♀ of *C. minimus* chooses preferably a flower-head of *Anthyllis vulneraria* either showing no, or only just commencing to show, yellow blossoms, walks down between the flower-buds, dragging its body between the woolly calyces, passing round the flower-head, and then, turning up its body, flying off to another head, repeating the process many times; the insect appears to lay only one egg on a head, and seems to show great discrimination in the flower-heads chosen, often settling on one, walking round it, and then flying off to another, or even to a third before being satisfied, and never appearing content unless there are some buds on the head, avoiding those where the blossoms have faded, leaving the calyx, the first food of the larva, dry; twice ♀ s were seen to settle on a flower-head of *Hippocrepis*, and, in one case, the insect remained some time, but no egg was discovered; the egg-stage lasted in this case six days, eggs laid on June 27th, 1866, hatching on July 3rd (Gedge). Eggs laid June 16th-18th, 1870, also on *Anthyllis vulneraria*, appeared to be deposited low down on the flowers, and, although hidden from casual observation, were not difficult to detect by careful search (Hellins). Many eggs were obtained at Eastbourne, on June 22nd, 1898, all being laid on the downy calyces of *Ornithopus perpusillus*,* three being forced down edgewise between the long hairs with which the calyces are covered; Buckler says that they are laid between the calyces, these were, by this time, well away from the surrounding calyces, and fairly exposed on the calyx on which they were placed (Postans). There was no trouble to find the rather bright green eggs of this species low down on the calyces of the flower-heads of *Anthyllis* (?) *vulneraria*, on the Albula Pass, August 18th-19th, 1908; they were somewhat easy to distinguish, possibly due to the fact that, owing to the lateness of the season, the flower-heads were all very mature (Tutt). On the Cotteswolds, as elsewhere, the eggs are laid on the calyces of *Anthyllis vulneraria;* they can be found in nature without much difficulty, the lovely pale green ova being fairly visible to the naked eye, among the pale downy hairs of the calyces to which they are attached; sometimes a flower-head has two eggs, possibly laid by two different females. On June 18th, 1906, in confinement, a female laid one egg each on three flower-heads, but two eggs were found on a fourth, although the latter had been laid quite separately, and were some distance apart (C. J. Watkins). The eggs are laid in the flower-heads of *A. vulneraria*, and, on the continent, on a red-flowered form, whose specific distinction I am not clear about. Sometimes an egg is laid on the corolla, but this is rare, the selected position is low down on the outside of the calyx, where two adjoining calyces touch one another. The egg is, however, laid on one calyx, and does not adhere to the opposite one. Sometimes they are literally between the two calyces, and they have to be separated before the egg can be seen, more usually they are just at the top of the point of touching, and can be seen without disturbing the flower. Sometimes they are lower down, when there is a little space between the flowers. It seems necessary to the butterfly in laying, that, not only should the ovipositor detect a suitable spot, but the abdominal dorsum should find an opposing surface. Whether this is necessary merely as a sensation or piece of information, or whether the *point d'appui* is required for the due working of the ovipositing machinery, may be matter for discussion; many Lycænids only lay their eggs in such situations, *i.e.*, where the abdominal dorsum comes in contact with an opposing surface (*Callophrys rubi*, etc., *see* preceding vol., p. 100). The heads selected for laying are those where the flowers are in full bloom, and only one egg is laid on each head. Still many eggs may be found on one flower-head, but almost certainly each laid by a different imago (Chapman). Two ova found on the calyces of a head of *Anthyllis vulneraria* on June 20th, 1900, at Reigate (Prideaux).

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* Bromilow reports this insect doubtfully from the Alpes-Maritimes, and it is reported from "Cher—St. Florent, very rare, and Nohant, June, rare," by Sand. One suspects these records are erroneous, and refer to highly powdered examples of *minimus*. Powell feels satisfied that the form *lorquinii*, as known in Spain, does not occur on the Mediterranean littoral. The only really recorded example appears to be that in Oberthür's collection received from Coulet. One feels that one would like further information concerning this specimen.

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* One wonders whether this is a slip of the recorder for *Anthyllis vulneraria*.

Ovum.—The egg presents an almost circular outline about ·4mm. in diameter, very flattened, the thickness being rather less than half the diameter. It is pale green in colour, with the surface crossed, as in the egg of *Agriades bellargus*, by two series of oblique white lines, cutting each other in opposite directions, and dividing the surface of the sides into rhomboidal, and higher up into irregular polygonal, divisions. The upper surface is not depressed, although somewhat flattened, and, in this respect, differs greatly from the egg of *A. bellargus*. The surface of the upper part of the egg is almost exactly like that of the sides, whilst, quite at the apex, a comparatively large and distinctly green micropylar area is conspicuous. At the exact centre of this area is a white point. At each of the points of intersection of the surface reticulation is a distinctly raised white knob; these are, however, less marked than those of *A. bellargus*. As the egg matures it loses its bright green colour, and becomes somewhat yellowish. [Described June 24th, 1898, from eggs found by Mr. R. D. Postans at Eastbourne, June 22nd, 1898.] (Tutt). Egg green, with white coating. By reflected light it looks nearly white, but when any light passes through the egg, the green colour is correspondingly distinct. The white adventitious coating is thin on flat upper surface, and apparently wanting centrally. The width is 0·45mm., the height 0·22mm. It is cheese-shaped, that is the top and bottom flat, the margins rounded. The flat top is about 0·38mm. across, the rounded margin therefore extends beyond this about 0·03mm. on either side (or rather all round). The top and bottom seem to be not absolutely flat, but rise a little. The centre of the top, for about 0·10mm. across, is green and duller than the rest of the top which is overlaid with whitish, corresponding with the density or absence of the white coating, which is slight till quite the margin of the top. The whole top is reticulated in irregular cells, the centre being, apparently, the ribbing of the egg-shell itself, the outer part having a white coating added. The cells are about 0·025mm. in diameter, about half this round the micropylar area. Towards the margins, where the white coating gets thicker, and all round the sides, the intersections have short raised pillars, with three- or four-fold knobs at top. The cells on top are somewhat irregular in form and arrangement, and may be so more or less down the sides, but here and there a whole side has the ribs running obliquely down, crossing one another (engine-turning pattern) making the cells fairly square, or at least rectangular. In the central circle (0·1mm. across) where the cells are all smaller, there is a central spot (hardly a cell) about 0·002mm. across. Round this, six cells of various sizes, all rather pear-shaped, with narrow end to centre, form a micropylar rosette, but they are less regular than one usually understands by that phrase. Round these, two rows of the smaller cells fill up the central area. These central cells carry several dots each as a sculpturing, as, indeed, do the other cells, when the white coating permits their being examined (Chapman, June 21st, 1908). Very small, shaped like the eggs of its congeners, *i.e.*, round, but more flattened than globular, with a central depression on the upper surface; this depression is the only place in which the pale green ground colour of the egg can be well seen; because the rest of it is closely covered by a raised white network of rhomboidal meshes, which, when viewed in profile, are seen to stand out boldly from the shell (Hellins). Of a glaucous hue, very perfectly reticulated, the meshes standing out in relief, perfectly rhomboidal, and knobbed at the junction of their angles (Gedge). The egg is figured by Clark (*Ent. Rec.*, xii., p. 282, pl. vi., fig. 7).

Habits of larva.—So soon as the young larva hatches, it bores through the calyx and corolla of a flower of *Anthyllis vulneraria*, and makes for the young ovary. At various stages of growth it will eat stamens, anthers, and large portions of calyx and corolla, in going from one flower to another when it is older, but its favourite and normal food is the ovary when it is young and succulent, afterwards the seeds, and its start and finish are so timed that at first it has for pabulum the young ovary, afterwards seeds of increasing age, finishing with fully-developed, but not hard and ripened, seeds; the larva, being full-grown, leaves the flower-heads only a day or two (in hot weather) before the heads are ripe, and the dead flowers containing the ripe pods are ready to drop off. Up to this date it is only where there has been more than one larva in a flower-head that any outward evidence of its presence appears (Chapman). The larva leaves the egg by an irregular aperture in the middle of its upper surface, usually bores a hole at once through the downy calyx and corolla of *Anthyllis vulneraria* into the flower, so as to reach the immature seed-vessel on which it feeds. Sometimes, however, a larva begins by eating the lip of the corolla, and then goes down to the base of the style, and thus to the ovary; the latter is certainly the part of the flower preferred, and, whilst small, the larva feeds thereon, hidden within the corolla, and leaving one flower when cleared and entering another. When the larvæ have attained some size they pierce the side of the calyx and corolla, and thrust in the head and thorax to get at the seed-pod with its single seed, for the whole of their bodies cannot now be entirely contained in the corolla, and they leave the hinder part outside, curled round the flower, but still well-hidden among the dense bunch of flowers that form each head, so that they may now be found with their heads thrust into the flower, the hinder part hanging out, but difficult to distinguish among the inflorescence. In about ten days, in a warm summer, they are barely half-grown, but, during the next fortnight, advance very rapidly, their colours assimilating, at this time, remarkably well with the changing colours of the corollæ of their food-plant (Hellins). When almost fullfed, and at rest, the larval head is entirely withdrawn, and the thoracic segments, pressed down ventrally, form a quite rounded front, whilst the body has an arched appearance, as described by Newman in comparing this larva with a *Chiton*. The anterior end of the body is, in this position, much wider and rounder than the posterior, the front abdominal segments being the widest. Its small, plump, arched body is settled flat down on the resting-surface, the yellowish colour, with faint red dorsal, subdorsal and lateral lines, being much modified by the numberless little black hair-bases, yet giving the whole a remarkably effective protection among the flower-heads of its food-plant. On the flower-heads themselves, many of the larvæ bring themselves quite inside a flower, others only the anterior segments, whilst the posterior hang outside, but really, these latter are almost as effectively concealed as the former. When walking, the larval movements are particularly slug-like, the little black head pressed down to the surface on which the larva is walking, and quite hidden when looked at dorsally, the prothorax forming as it were the front part of the gliding larva which moves along fairly rapidly, yet with scarcely any perceptible muscular movement, except a slight working from side to side as the forward movement is made. When, however, a break in its path occurs, the head is thrown up, the prothorax much narrowed and extended to its full length, the head turned from side to side in an enquiring way, and stretched to its farthest limits, until the further forward progression of the larva is assured, and, at this time, its lengthened body has quite a different appearance from that of its stumpy body when at rest or moving slowly, and without need to discover its whereabouts. Looked at sideways, its movements are very interesting, the anal prolegs being placed some distance beneath from the extreme end of the body, raises it naturally from the surface, and, when movement takes place, a sort of wave passes along the larval body. The true legs appear to be kept continuously in motion, but this is not so, and the forward movement of the prolegs is in series, the anal prolegs being pushed forwards a step, followed directly in order by the fourth, third, second, and first prolegs, and then by the third, second, and first true legs, a wave as it were pulsing along the segments as each pair of prolegs is pushed forwards, and takes a fresh hold, the anal segments being continuously lifted up and down as it were, as the anal prolegs take a grip forwards, and are immediately, as the motion is transferred to the pair of prolegs in front, lifted again, to be as quickly pushed forwards, so as to get a fresh grip, and start a fresh series of forward undulations. When a larva is coming from a calyx-tube head-first, it projects its head as far as possible, and uses its prolegs, with a sort of screw movement, to wriggle the front segments out of the hole thus formed, a hole apparently very small, and out of all proportion to the size of the body; when, however, its front segments are free, it bends down and uses the true legs in order to cling to the outside of the calyx, and soon levers the rest of the body outside the hole. The larva makes excellent use of its silk-spinning power. It falls at the least disturbance, doubles itself up ventrally, and remains for a time quite immovable, and then, pushing forwards its head as far as possible, attempts to get a grip with its true legs, and slowly rolls itself over. The power of hanging by an almost invisible silk thread makes it sometimes appear to undergo many strange evolutions, of which the ability to stand with its back to the resting-surface and its legs in the air, and then slowly change its position and bring its legs back to the resting-surface, and go on crawling, is one of the most peculiar, for the silk that supports it and enables it to do this is quite invisible. The larvæ crawl about over each other with no apparent harm, no notice being, as a rule, taken, though occasionally one notes a badly-bitten example when many are kept in close quarters in confinement, but one suspects that this is done when the victim is partly buried in a flower, and a friend, utterly oblivious of its presence, buries its jaws into the immobile larva instead of the flower it supposes should be there. A larva can cross any distance it can possibly reach with its mouth, spinning a second silken bridge that it walks over, in slow and approved manner. This movement is, for the size of the larva, and considering its mode of walking, really rapid. The larvæ continuously crawl away out of observation when one has them on a table, etc. (Tutt, July 12th, 1908. Larvæ from Glion). On July 2nd-4th, I found larvæ of *C. minimus*, at Glion, in heads of *Anthyllis vulneraria*. Those first found were fullgrown on flower-heads with seeds all but ripe. Other places about, however, presented the seeds ready to fall, or actually falling, and the depredations of the larvæ were common, but the latter, with rare exceptions, gone. It is of interest to note that the hay (everything is cut for hay at Glion) is cut at a stage at which the larva has just left the flower, or is just about to do so, and does probably do so whilst the hay lies cut, and before it is carried. In various meadows where the hay is cut, or about to be, but not yet cut, the majority of heads are already abandoned. The cutting of hay here, therefore, at any rate, is not fatal to this species as it is to so many. There is some little variation in the habits and colouring of the larva. Usually the larva is inside the distended calyx, and eating the seed out of the little pod, not, unfrequently, apparently, having entered it from the top, that is the natural opening from which the corolla projects. As frequently, or perhaps more so, it has entered by a hole at or near the base, and other flowers are found that had previously been entered by the same larva, and of which the seed, or if young enough the pod also, had been eaten, but it often happened in these cases also, that the larva and its works were not easily noticed, the larva being detected by the way in which the calyx is more than usually distended, sometimes by holding the head up against the light, and sometimes by feeling the full calyx with the fingers. In some cases, however, the larval damage was more evident, the larva passing direct from one bloom to the next, at first, perhaps, directly, but afterwards by aid of a cavity at the bases of the flowers, which were more or less fastened together by silk, making a sort of cocoon about the size of the larva, which would usually be in one of the calyces. In those heads which the fullfed larva had left, the difference was very marked, some having the flowers fastened together and plundered from a common cavity; in other cases, and more frequently, the hollowed pods were in flowers each as separate as they are naturally. All the larvæ were identical in markings, but these were faint in some very pale specimens, that one is almost tempted to call white, whilst other larvæ are of a red-brown, in which the markings are pronounced. On July 5th, I made special observation as to how larvæ attack the calyx contents, and found several flower-heads with one calyx containing a fullgrown larva, but with no trace of where the larva had gone in, either in that flower or in others it had eaten out. In these cases it is clear that the larva always entered by the top of the calyx, in others, all eaten flowers had holes, and frequently the holes in the calyces were connected together by some slight spinning (Chapman). The discovery of the larva of *Gelechia umbrosella*, led to my finding the larva of *C. minimus*, which has a similar mode of life, for this also lives in the flower-heads of *Anthyllis vulneraria* at the same time, also draws the flowers together, bores through them, excavates the seeds on which it feeds, and deposits its reddish excrement between the blossoms ; it differs, however, in that it leaves the plant when fullfed, and rests in crevices or other hiding-places, a few pupating and producing imagines in late July or early August, whilst a far greater number hybernate as larvæ, not pupating until the following May (Gärtner). When fullfed, the larvæ select a suitable place for hybernation, and, spinning a silken web, attach themselves thereto, and take up a fixed position for the winter, being, apparently, somewhat averse to disturbance during this period. The position taken up is maintained until the end of the following May or June, the larva remaining perfectly still for some nine months or more, before pupation. Rayward notes finding fullfed larvæ on July 12th, and again on August 9th, 1906, at Horsley. Chapman states (*in litt.*) that, in hiding away for the winter, the larva, so far as its proceedings in captivity show, seems to desire to reach some hollow or crevice. Several specimens made use of the remains of dead flowerheads of *Anthyllis* lying on the bottom of the box, to make what must be called a cocoon, although it consisted of very few threads, and gave way on very slight disturbance; one actually in the middle of a head had drawn the surrounding calyces together rather more firmly, but still very slightly, but what one remarked was, that, slight as the spinning was, it had drawn the dead flowers together, so that the larva could not be seen until some pulling to pieces was done. "Forwards" are occasionally developed in the southern parts of England and in central Europe, and most warm seasons produce a more or less numerous partial second-brood of imagines in late July or early August, the progeny of which are usually fullfed in September. This number of "forwards" is much greater in southern Europe. Wood observes that, on September 3rd, 1905, whilst searching among *Helianthemum vulgare*, near Ashford, he discovered a larva, apparently fullfed, and settled for hybernation low down on a stem of this plant. Lambillion says that the larvæ hybernate under the leaves of the foodplants, very near the axil. The habits of the larvæ appear to be much the same in Germany as elsewhere, and Schmid and Stange record the finding of larvæ in the blossoms of *Anthyllis vulneraria*, whilst Mühlig discovered them in the blossoms and seedpods of the same plant. Zeller states (*Stett. Ent. Ztg.*, 1877, p. 293) that the larva lives in the pods of different Papilionaceous plants; near Jena in those of *Astragalus glycyphyllos* and *A. cicer;* at Tuors Pensch, in those of a tall herbaceous papilionaceous plant with pale yellow blossoms, out of which they crept in numbers in August after the withering of the foodplant, the larva living through the winter, and pupating the following April. Schläger also found larvæ in August in the pods of the same two species of *Astragalus*. Aigner-Abafi, however, records (*Illus. Zeits. für Ent.*, iii., p. 328) that, in 1897, whilst searching for larvæ of *Nomiades iolas* in the pods of *Colutea arborescens*, near Budapest, he found, in the pods, the larvæ of *C. minimus*, hitherto, he says, only known in the district from *Coronilla varia* and *Melilotus*. He further adds that Szépligeti found the larva of *C. minimus* in the seed-heads of *Sanguisorba*, from which he bred quite normal examples.

Larva.—When newly-hatched exceedingly tiny, dirty whitish-green in colour, head black, a dark area on prothorax, the tubercles with longish hairs; after a day or two the colour becomes somewhat reddish, at the end of a week pale brown, with browner dorsal and subdorsal lines (Hellins). *First instar* (newly-hatched): Almost colourless, except black head, and legs, and hairs, though the hairs are pale at first emergence. The length is a bare millimetre, and the head is proportionally large (about 0·25mm. across). The prothorax is also pro-

PLATE XI.

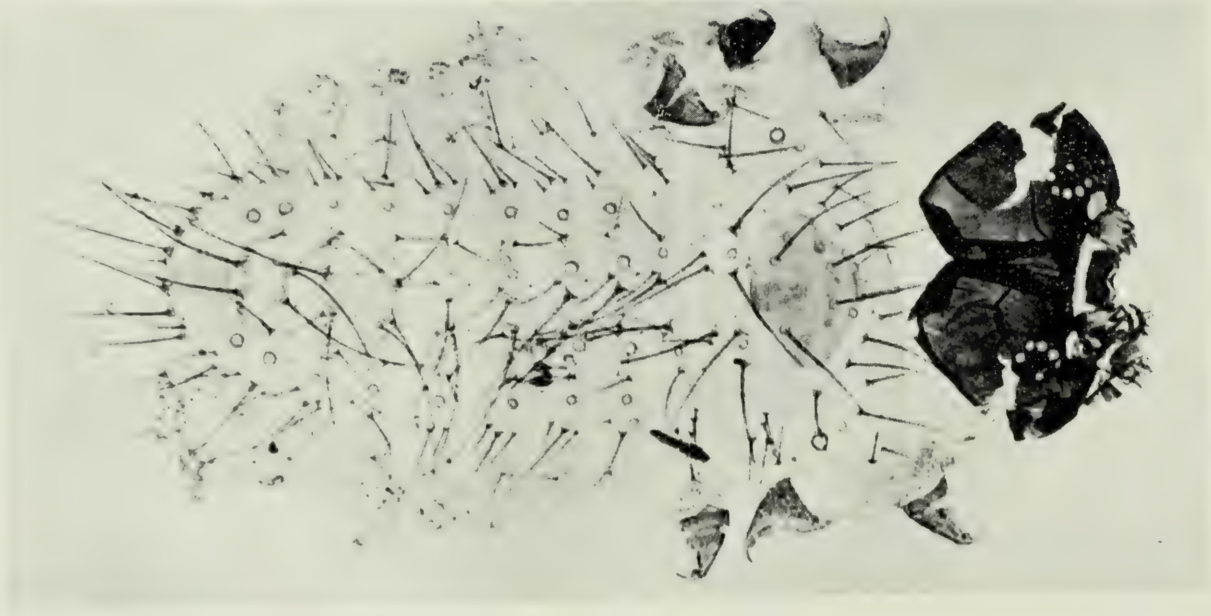
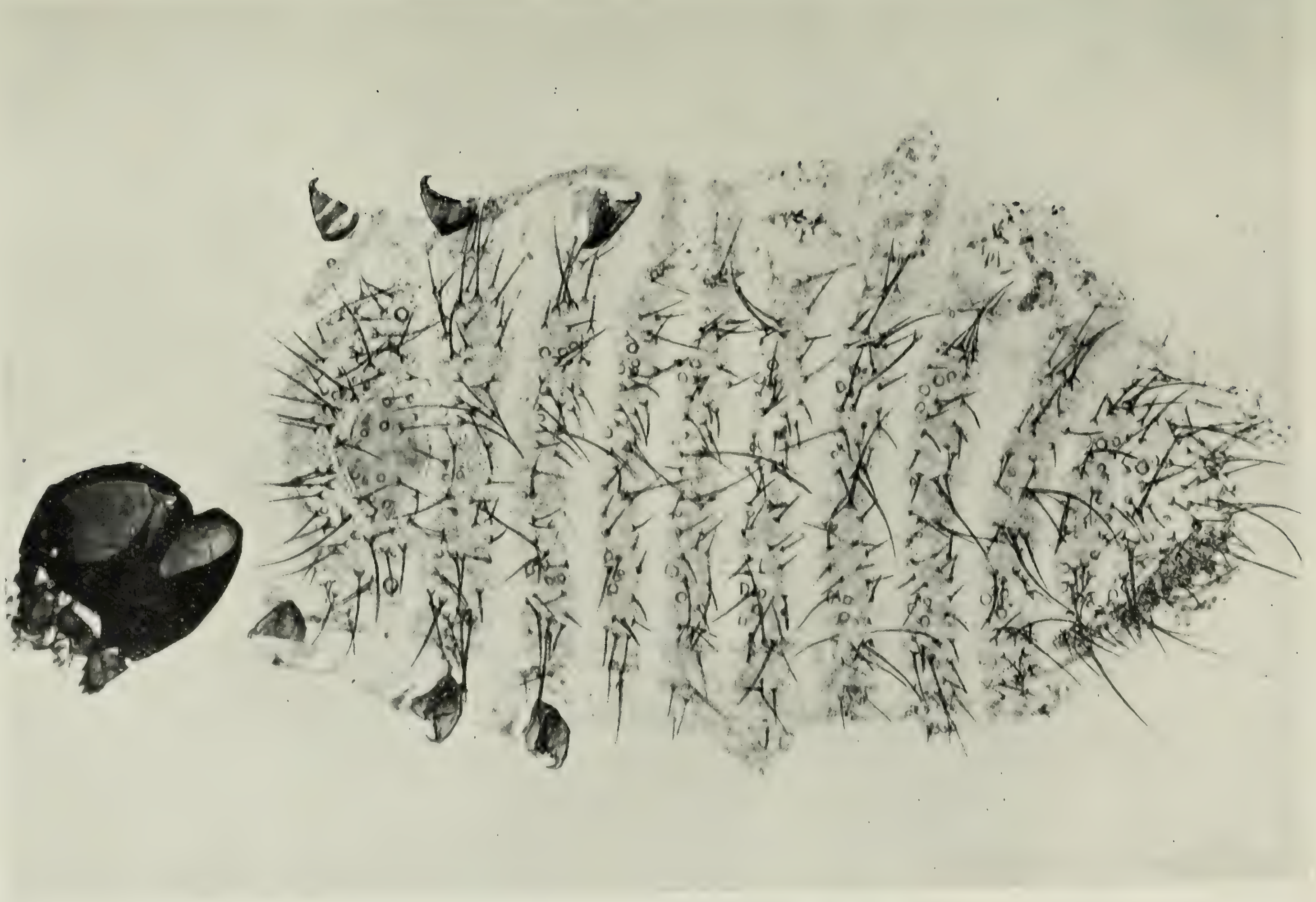


Photo. F. N. Clark.

LARVAL SKIN OF CUPIDO MINIMUS (FIRST INSTAR) × 90.

[*To face p.* 121.]

portionally large, 0·20mm. in length, out of 1·00mm. The dorsal hairs are long (0·16mm.), and the lateral 0·11mm. down to 0·05mm., or even shorter. The hairs taken in series are i longest, ii more than half as long, two supraspiracular hairs on each segment, and three below the spiracle; lower are two marginal hairs level, and two at the base of prolegs. Of lenticles, there are two on each segment below i and ii. The head has a few fine hairs. There are five ocelli in a semicircle round a sixth central one, all of about the same size, and, whilst the head is black, the mandibles are of a brown chitinous tint, and have five teeth. There are four hairs along the front of the clypeus, and three very fine ones on each side of the labrum. The antennæ have two short broad joints, the second carrying a long hair, and a small complicated joint. The prothorax carries a plate 0·18mm. across, diamond-shaped, with the angles very rounded, and the front projecting more than the posterior edge. The plate has, on each side, a long hair (0·15mm.) towards middle of posterior margin, and one rather shorter near middle line, rather nearer front than posterior margin, and a short one nearer middle line on front margin; a little outside the last is a large lenticle, and further out and up on the disc three dots, one, larger than the other two, is a small lenticle, the others probably obsolete lenticles or hairs. Then there is, a little way in from the external angle, the remarkable hair found in these Lycænids, on a peculiar base, and, being itself slender, and threadlike, and, unlike any other hair on the larva, so fine is it that it is difficult to see, and may be 0·08mm. long or more. In front of the plate are the usual three hairs on each side, with one further back near the angle (all about 0·12mm. long); there are also two some way in front of the spiracle, and two smaller lower down, and two very minute ones close to base of legs. There is a large lenticle in front of spiracle. On the mesothorax and metathorax, the dorsal tubercles might be described as duplicated. On the mesothorax there are two tubercles (hairs) to i, one in front of the other, some little way apart; the front one has a lenticle just outside it, and then another long hair; the posterior one has a hair related to it just as ii is to i on the abdominal segments. Lower down are four hairs corresponding with the three subspiracular hairs of the abdominal segments; the outer of the two front dorsal hairs would, therefore, probably correspond with the supraspiracular of the abdomen. These four subspiraculars of mesothorax are three in an oblique row downwards and backwards, the fourth above, and behind the third; there are the two marginal hairs some little way above the legs, the minute ones close to the leg belong rather to the leg than to the ordinary tubercles. The metathorax has tubercles i and ii much as on the abdominal segments, or as the posterior pair on the mesothorax, yet the i corresponds, not with the posterior but, with the front i of the mesothorax, in so far that, like it, it has outside it first a lenticle and then a hair; this hair on meso- and on metathoracic segments, may correspond with the supraspiracular (iii ?) of the abdominal segments, but it differs in being one long hair instead of two very short ones. The four subspiracular, and two marginal hairs are as on mesothorax. The abdominal segments have the hair on i long, that on ii shorter; two lenticles, a large anterior and upper one, and a rather smaller one; two short hairs, a front one about 0·06mm. long, and a posterior about half that length; the spiracle; three hairs not quite in a line (longitudinally), the larger (0·14mm.) middle one being a little lower than the others; then two marginal hairs (posterior longer, about 0·06mm.), and two minute hairs at base of prolegs. From this, the 1st abdominal differs in having a lenticle in place of the anterior subspiracular hair, and only one marginal hair. In another specimen the subspiracular lenticle does not displace a hair, all three hairs being present. Frequently a lenticle replaces one of the marginal hairs on the 2nd abdominal segment, which has usually no other spiracular lenticle. In the specimen photographed, the irregularity of these lenticles is illustrated, the second abdominal having a subspiracular lenticle as in the 1st abdominal, on one side, but on the other it replaces one of the marginal hairs. The 3rd, 4th, 5th, and 6th abdominal segments are as described. On the 7th, tubercle ii is replaced by a lenticle (or rather, perhaps, ii is absent, and the lenticle pushed up); there is only one supraspiracular hair with a lenticle (second lenticle or two supraspiracular hairs ?) just behind it, and only two subspiracular hairs. On the 8th abdominal segment there is, above spiracles on each side, only a conjoined plate carrying i and a large lenticle; the hairs on i, on the 7th and 8th abdominal segments, and the marginal ones behind, are very long, nearly 0·23mm. On the 10th abdominal segment is a small square (anal) plate (about 0·05mm. across) without hair or lenticle. The hairs round the posterior margin cannot be definitely assigned to the 8th, 9th, or 10th abdominal segments; there are, on each side, two long ones posteriorly, and one further out (probably on the 10th segment) and a further one (probably on the 9th segment), with seven short hairs; below the margin the short hairs belong apparently to the base of the claspers. The prolegs and claspers consist of an anterior and posterior set of hooks, each consisting of one larger and one minute hook, the latter not infrequently missing. The true legs have the usual three joints, the first short and broad, the last long and narrow, with a well-curved hook. The hairs are very finely spiculated, so finely that, without considerable magnification, one takes them to be smooth; their bases are simple cones. The general surface is covered by fine skin-points, more pronounced over the middle of the segment than towards the incisions; near the latter they seem (in a mounted skin) to be mere points, but, near the summit of the segments, they have a polygonal aspect, not quite square, and with angular irregularities. They are about 0·0015mm. in diameter, and a similar distance from each other, varying with the degree to which the skin is stretched, irregularly placed, but often here and there in rows running nearly longitudinally or transversely; so far as a count is possible, about twenty points from back to front of a segment. *Second instar:* In the second instar the larva reaches 3mm. when fully stretched, the black head is 0·42mm. wide, a greater growth from the first instar than it makes at the next two changes. There is a considerable increase in the number of hairs, but lenticles have nearly disappeared from the dorsum, but have increased in number, although not proportionally in size, in the spiracular region. The hairs are actually longer, but proportionally shorter, i on the abdomen being about 0·2mm. in length. Taking the 2nd abdominal as a sample, we find on each side i and ii much as in the first instar. In front of them are two shorter hairs, one nearly in front of the other; between them and the spiracle are seven short hairs (about 0·06mm. or 0·07mm. long). There are no dorsal lenticles, but three

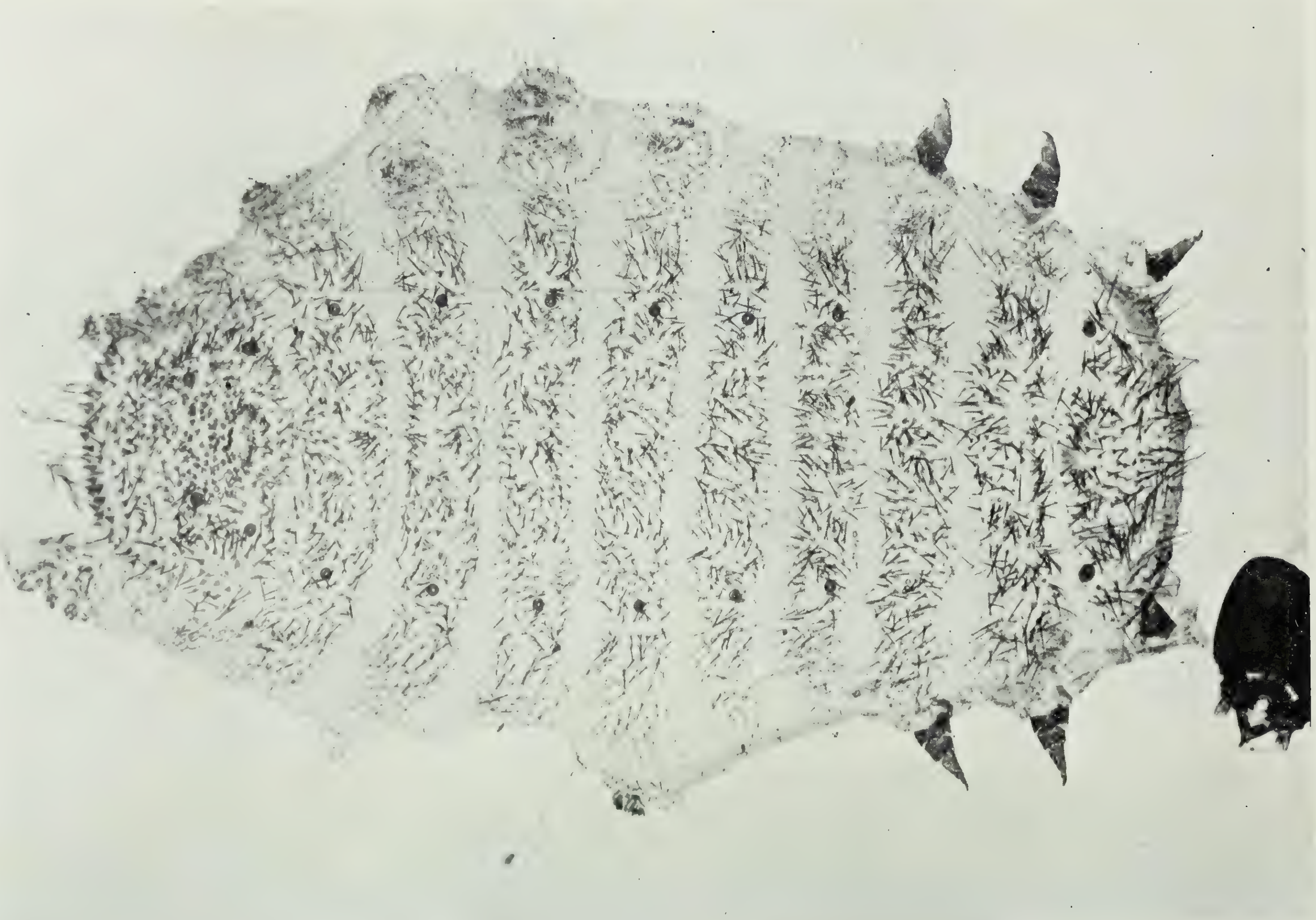


LARVAL SKIN OF CUPIDO MINIMUS IN SECOND INSTAR × 70.

Photo. F. N. Clark.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 122.]

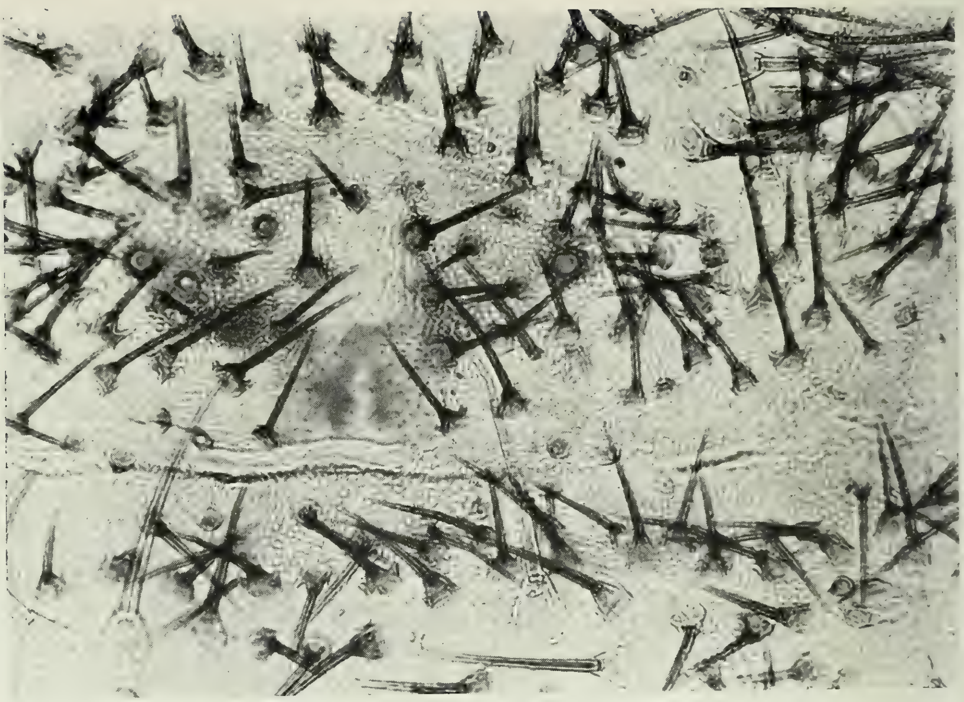


LARVAL SKIN OF CUPIDO MINIMUS IN THIRD INSTAR × 26.

Photo. F. N. Clark.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 123.]



1. PROTHORACIC PLATE OF LARVA OF CUPIDO MINIMUS (3RD INSTAR) × 150.

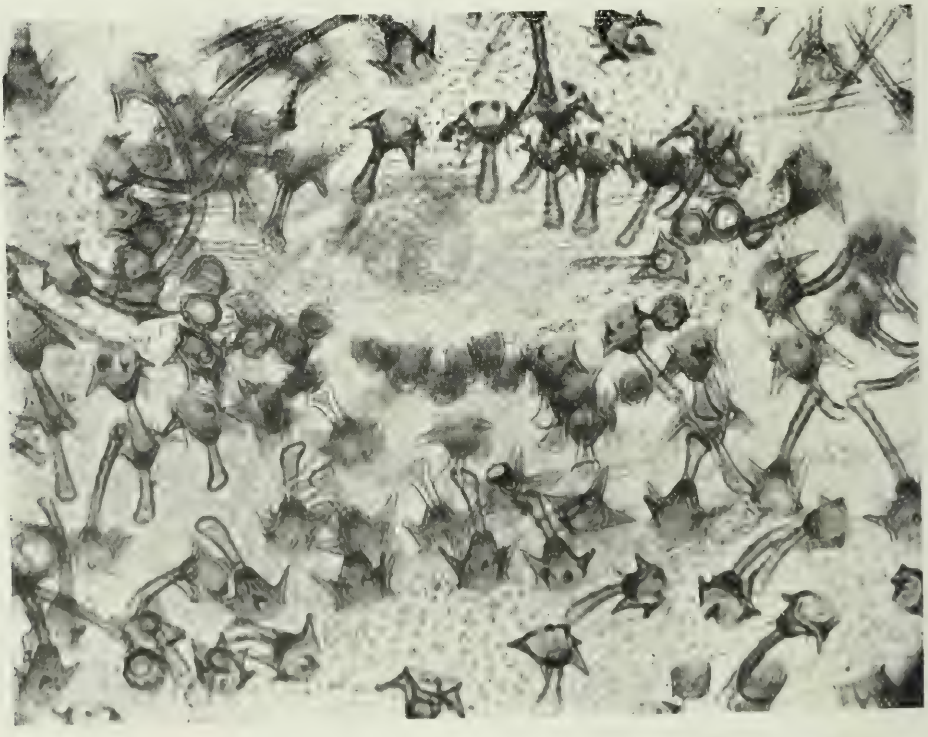


Photo. F. N. Clark.

2. HAIRS SURROUNDING HONEY-GLAND OF LARVA OF CUPIDO MINIMUS (3RD INSTAR) × 250.

LARVAL STRUCTURE OF CUPIDO MINIMUS.

just above and in front of the spiracle. The subspiracular group (three hairs in first instar) has six hairs, two longer, about 0·15mm. The marginal series three longer (0·10mm.), and two or three shorter, with a minute lenticle or two. The prothoracic plate is larger, and varies a little as to hairs ; in one specimen it has only one pair of hairs ; there are about 28 other hairs on either side of the prothorax. The hairs round the margin of the 8th, 9th, and 10th abdominals are long and numerous, not distinguishable, for counting, from those rather more dorsal. The spiracular lenticles become large and conspicuous on the 7th and 8th abdominal segments. The gland of the 7th segment is quite obvious (wanting in first instar), but the processes (or caruncles) of the 8th are not seen, but, in some specimens, there is here a slight crowding of skin-points. Each pad of prolegs possesses three hooks, three large, or two large and one small, sometimes, however, only two, both large. The special corner hair of the prothoracic plate is about 0·1mm. long. The skin-points are as numerous as in first instar, but are now obviously conically or pyramidally pointed. The hairs are more easily seen to be spiculate, and the hair-bases and lenticles show some stellate structure. On the anterior segments, here and there a hair-base has a raised point or two, but on the posterior segments all the larger hair-bases have a number of upstanding points irregularly placed, but tending to form a ring about half-way up. The lenticles which generally have a cylindrical form, have the margin with one or more points, rarely sharp. There are three or four lenticles close to the gland on the 7th abdominal segment, remarkable because dorsal lenticles are rare elsewhere. *Third instar* (July 6th, St. Jean-de-Luz): Length 5·5mm. At first glance one would say a white larva with ochreous (brownish, terra-cotta) markings. More correctly the larva is brownish-ochreous, with lines of dorsal flange and two oblique lines below nearly white. These are so broad that, except the median dorsal line, they absorb nearly the whole larva, as seen from above. There is a broad band of ground colour along the (black) spiracles, with white lateral flange line below. The larva is too rounded for the flange to be more than a name from analogy with other Lycænid larvæ. It is uniformly studded with very short, dark (black or deep brown) hairs ; head black. A few dorsal and lateral flange hairs are longer than the others. There is a distinct depression at the prothoracic plate, and the prothorax often looks very dark, from head shining through. In the third instar the head is about 0·66mm. across. The prothoracic plate is about 0·33mm. from angle to angle ; the special angular hair has a rather elaborate base; the plate carries about fourteen hairs, and several lenticles on each side, and is covered with fine skin-points. The central area, without hairs, is very narrow in front, but wider (about 0·1mm.) behind. The rest of the segment carries about 50 to 60 hairs above spiracles on either side. The 1st abdominal segment (as an example) has about 140 to 150 hairs from spiracle to spiracle. The longest hairs dorsally and laterally are about 0·15mm. long, the mass about 0·06mm. ; these have rather long, very fine, spicules. The bases of hairs carry four or five strong sharp spines or spicules at about half their height. In the neighbourhood of the gland in the 7th abdominal, as well as an additional number of lenticles, are numerous hairs remarkably modified. The hairs are no longer than their bases, and are enlarged upwards, so as to leave bulbous rounded ends, set with abundant fine spiculæ; they are in fact trumpet- or umbrella-hairs; further away from the gland these hairs become modified, gradually becoming like ordinary hairs with a somewhat bulbous spicular extremity, and further off merge in the ordinary hairs. Lenticles are rare over the dorsum, but, lower, are frequent along the anterior borders of the segments, and above, and near, the spiracles, as well as near the honey-gland. They vary a good deal, some are shallow rings, the majority are as high as broad, and, as well as a nodulated margin, carry, half-way up, a circle of fine points. Some are taller, thimble-shaped, *i.e.*, very narrow at top. The honey-gland is a slit about 0·25mm. across, with hairs, as noted, round it, and a row of lenticles along its posterior border. The presence of fan-organs (or caruncles) (8th abdominal) is obvious, but nothing definite of their structure is observed. The spiracles are round, and, in preserved specimens, present a lower larger, and smaller upper, ring, connected by eight to ten flying buttresses. The two pads of prolegs each carry eight hooks, alternately large and small. The general surface is clothed with fine sharp skin-points. *Last instar:* In the fourth (last[*]) instar, the hairs are a little longer, and much thicker than in the previous skin. There is, however, greater variety in the length of the hairs. The spicules are much bolder, but much fewer, so that many hairs look (and are?) quite smooth. There is no specialisation near the honey-gland. The hair-bases are much more markedly stellate than previously, but for the most part may still be described as having four to six sharp upstanding spines; by stellate, I mean that the spines are longer and more radial in direction. The honey-gland is surrounded by strong hairs, but only a few lenticles. The fan-organs are distinct, but structure not determined; round them the skin-points, no longer sharp, but flattened and rounded, are arranged in a radial manner. The prothoracic plate is 0·6mm. across, and has, at each angle, the remarkable, flat, circular base of the special hair, which is 0·5mm. long, excessively slender and threadlike, apparently of same diameter for its whole length, a diameter about one-sixth or one-eighth of the ordinary hairs. Lenticles are seen in a row of five or six along the anterior margin of the segments just above the spiracle, and in little groups of six or eight above and behind (but close to) the spiracles; they are rings of various height, with marginal points of very varying size, rarely with any lateral ones. Many look like the conventional crown, with few and blunt rays. Spiracles as in previous skin. Each pad of the prolegs possesses nine hooks, five large, and four small intermediate ones. The skin-points are for the most part flat, but in places are acute. In one or two prepared specimens, the relation of the skin-points to each other is well shown. They look very like the pattern on the eggs, *viz.*, are arranged in triangles (hexagon with one in middle), and from each to its six neighbours there is a raised, or what looks like a raised, line (Chapman). *Final instar:* When fullgrown about 8mm. long, and may be roughly compared with a moderately-sized grain of wheat cut in half, the back being arched in a curve, and the belly flat, with the legs placed well under it, or it may be compared with a very tiny

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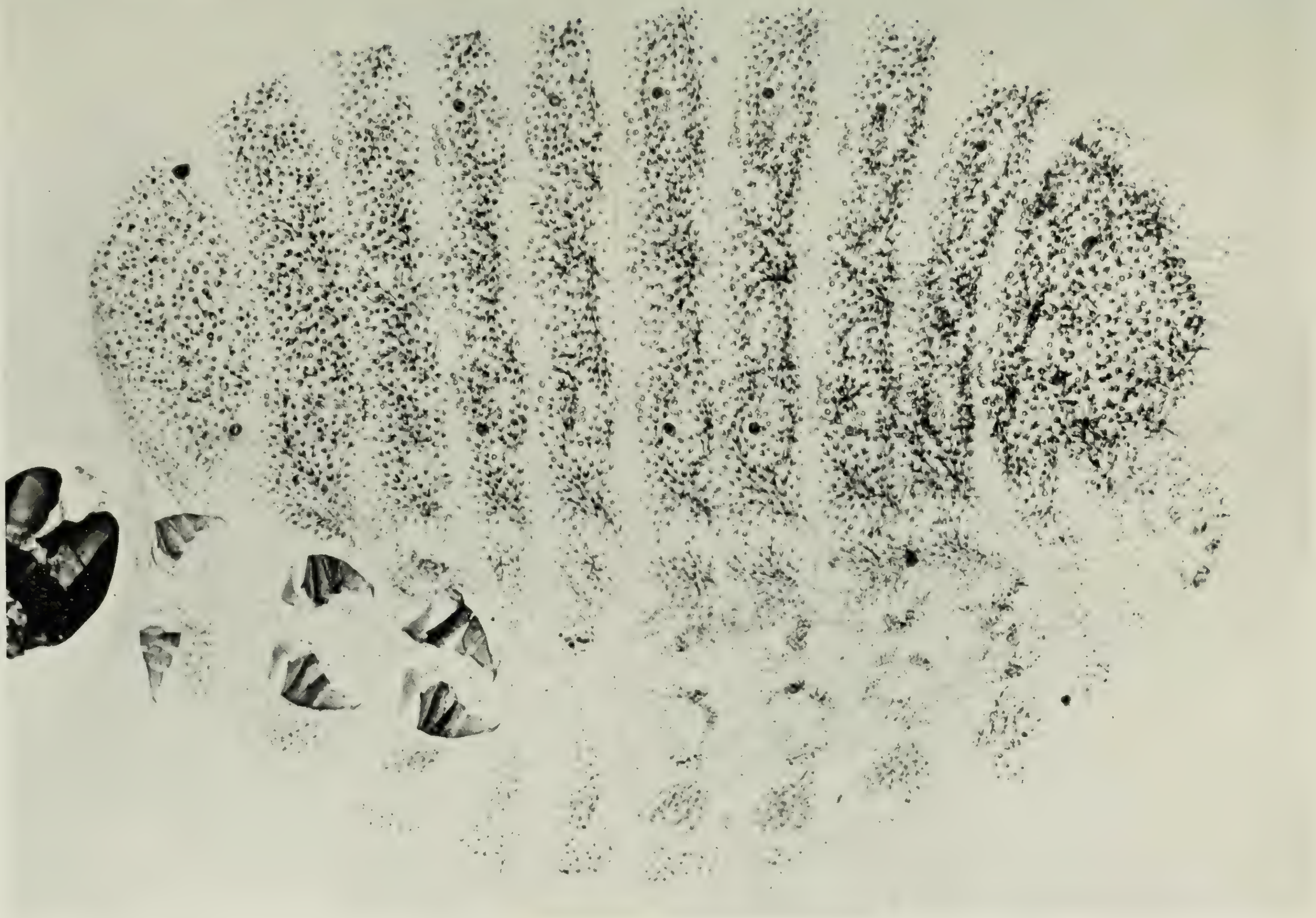
[*] I do not find I have any definite notes of the number of moults; my strong impression is that there are three, the specimen described (and preserved and labelled) as in third moult is in the penultimate instar.

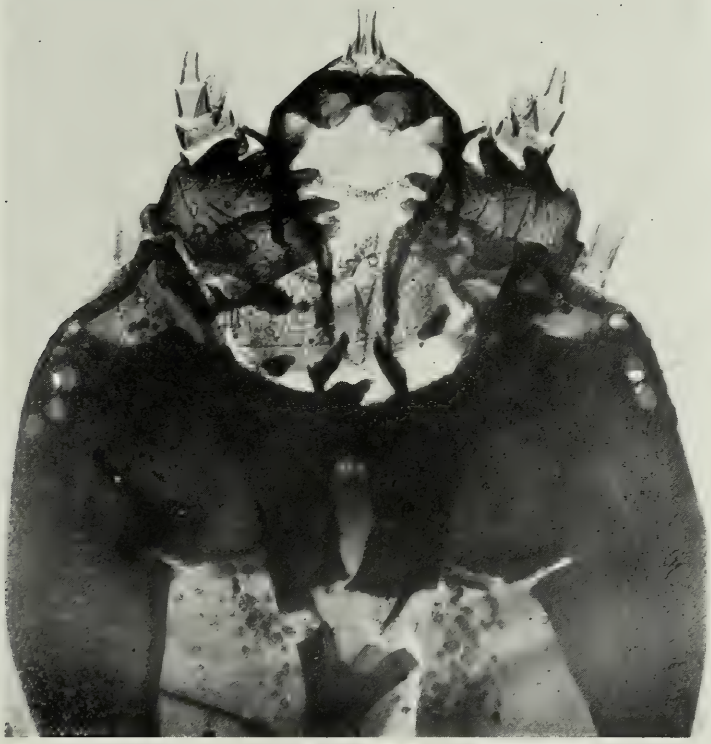


LARVAL SKIN OF CUPIDO MINIMUS IN FINAL (4TH) INSTAR × 21.

Photo. F. N. Clark.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 124.]



1. CRANIUM SHOWING MOUTH-PARTS OF LARVA OF CUPIDO MINIMUS IN LAST INSTAR × 90.

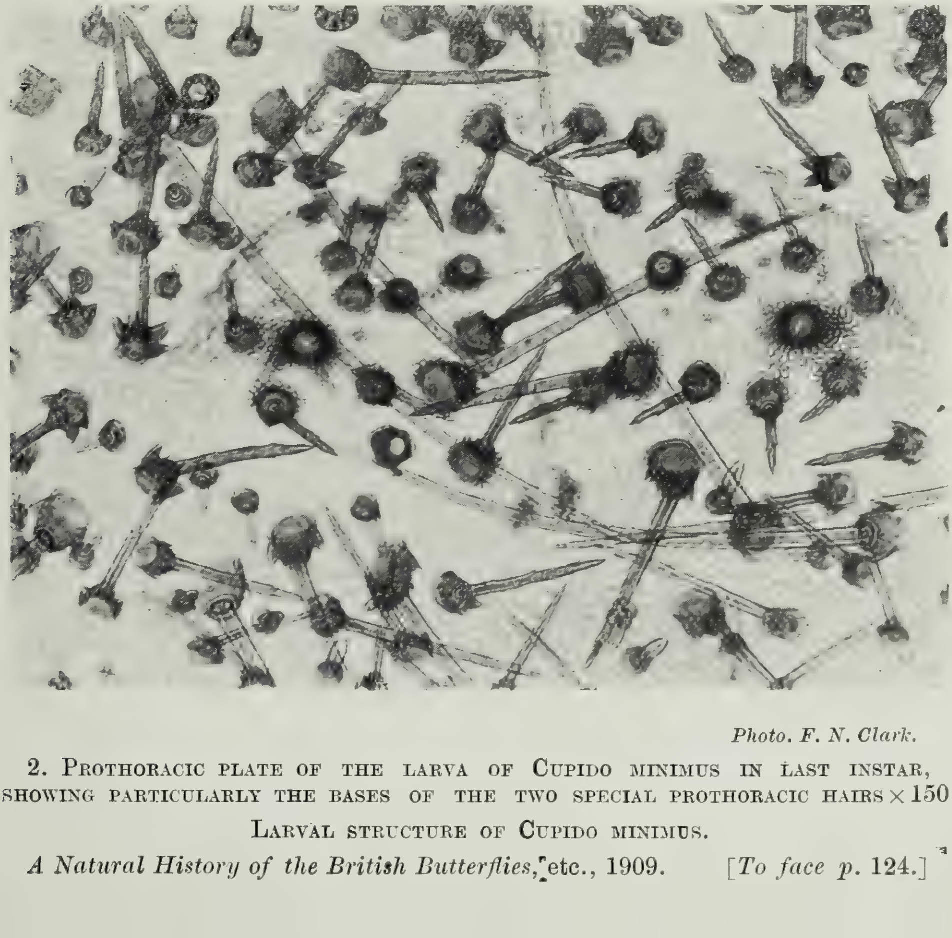
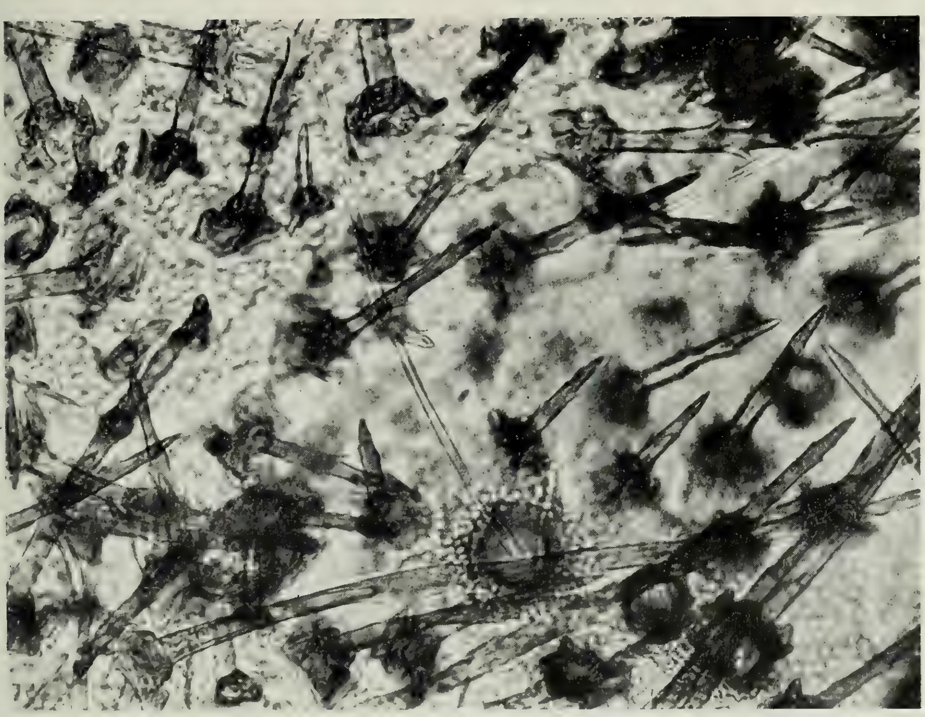


Photo. F. N. Clark.

2. PROTHORACIC PLATE OF THE LARVA OF CUPIDO MINIMUS IN LAST INSTAR, SHOWING PARTICULARLY THE BASES OF THE TWO SPECIAL PROTHORACIC HAIRS × 150.

LARVAL STRUCTURE OF CUPIDO MINIMUS.

A Natural History of the British Butterflies, etc., 1909. [*To face p.* 124.]



1. Special prothoracic hair and hair-base of larva of Cupido minimus compared with ordinary hairs, last instar × 250.

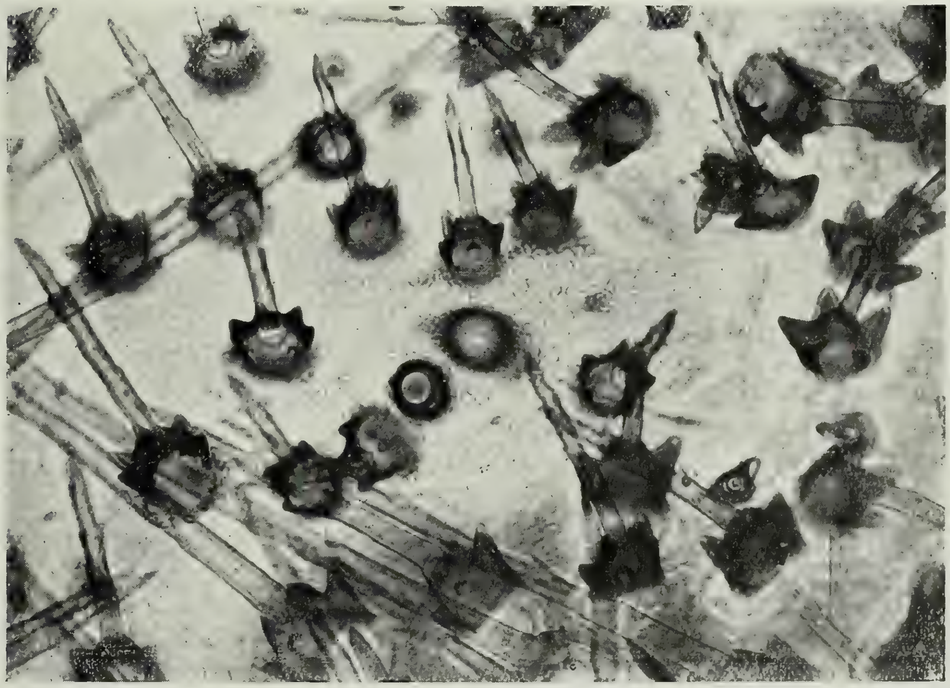


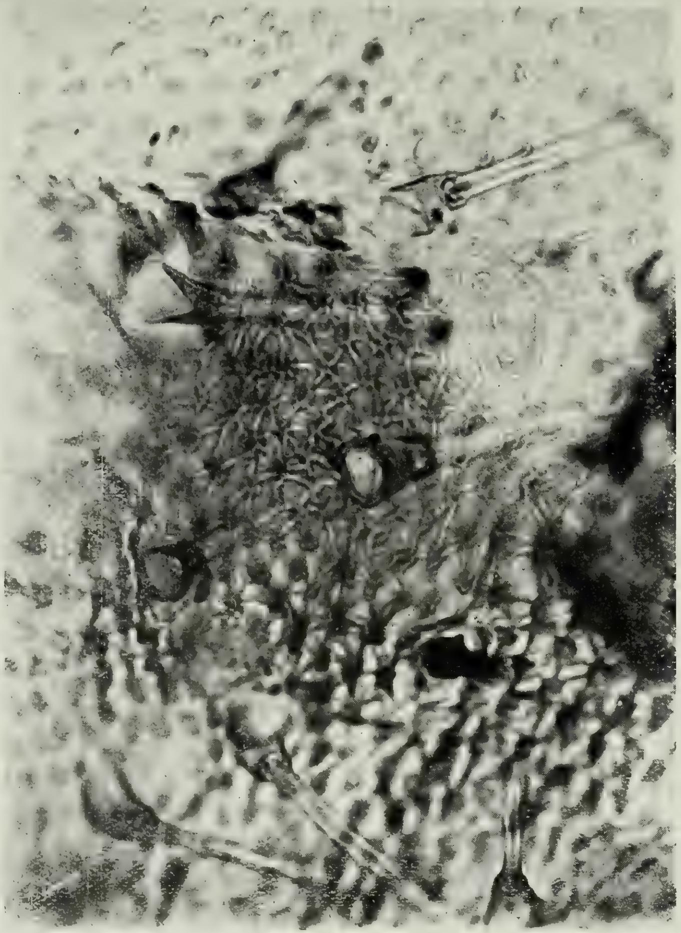
Photo. **F. N.** *Clark.*

2. Skin-sculpture round base of special prothoracic hair of larva of Cupido minimus, last instar × 250.

Larval structure of Cupido minimus.

A Natural History of the British Butterflies, etc., 1909. [*To face* p. 124.]

PLATE
XVIII.



1. SCULPTURE OF SKIN-SURFACE OF LARVA OF CUPIDO MINIMUS, LAST INSTAR, SHOWING ITS RESEMBLANCE TO SCULPTURE OF EGG OF SAME SPECIES × 350.

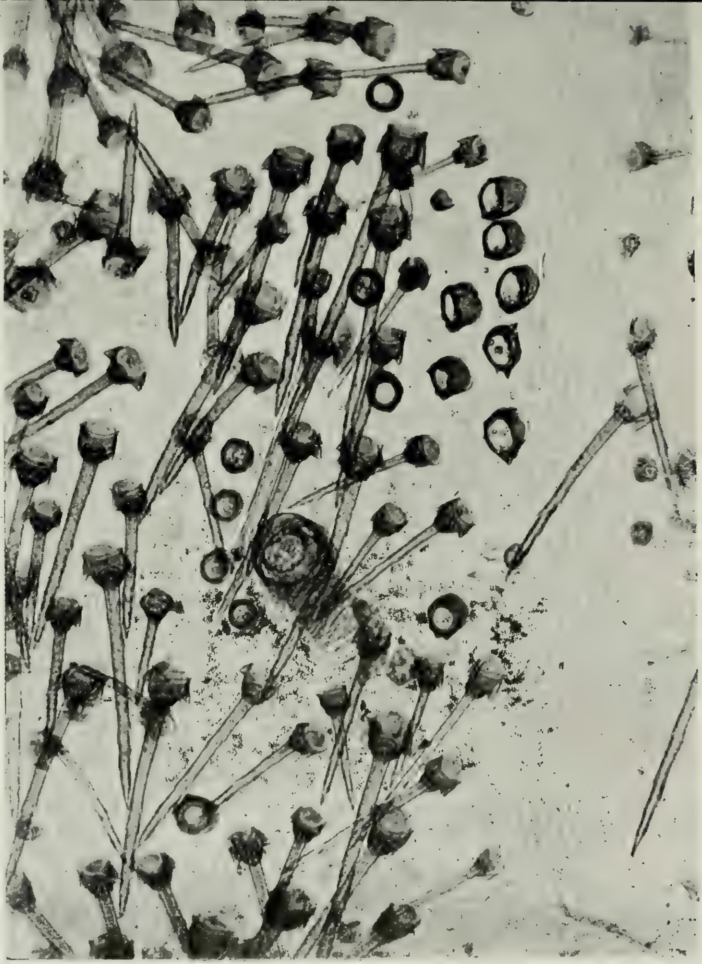
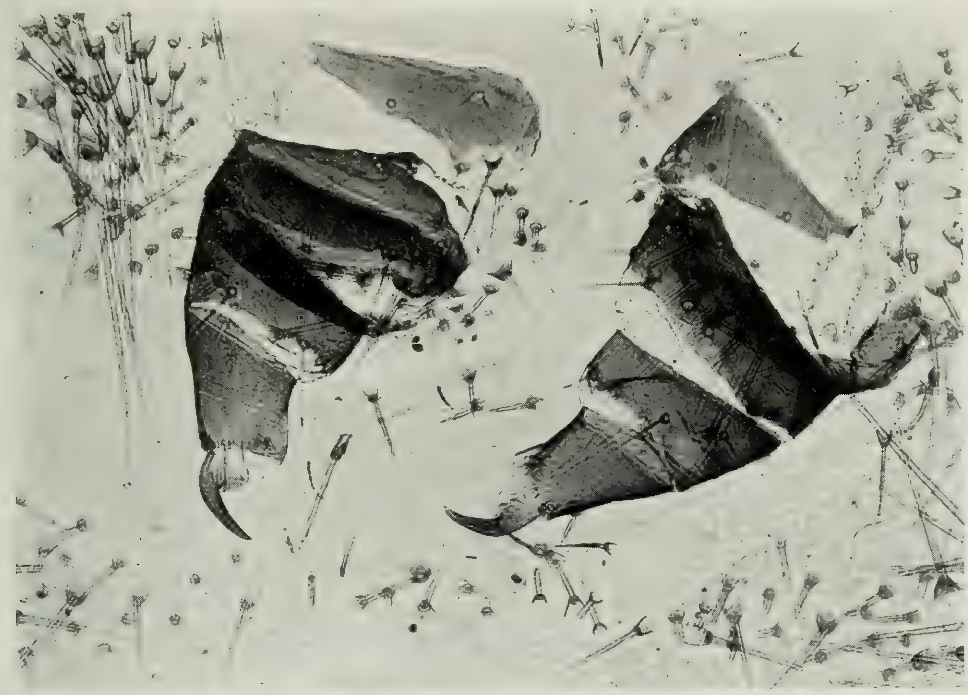


Photo. F. N. Clark.

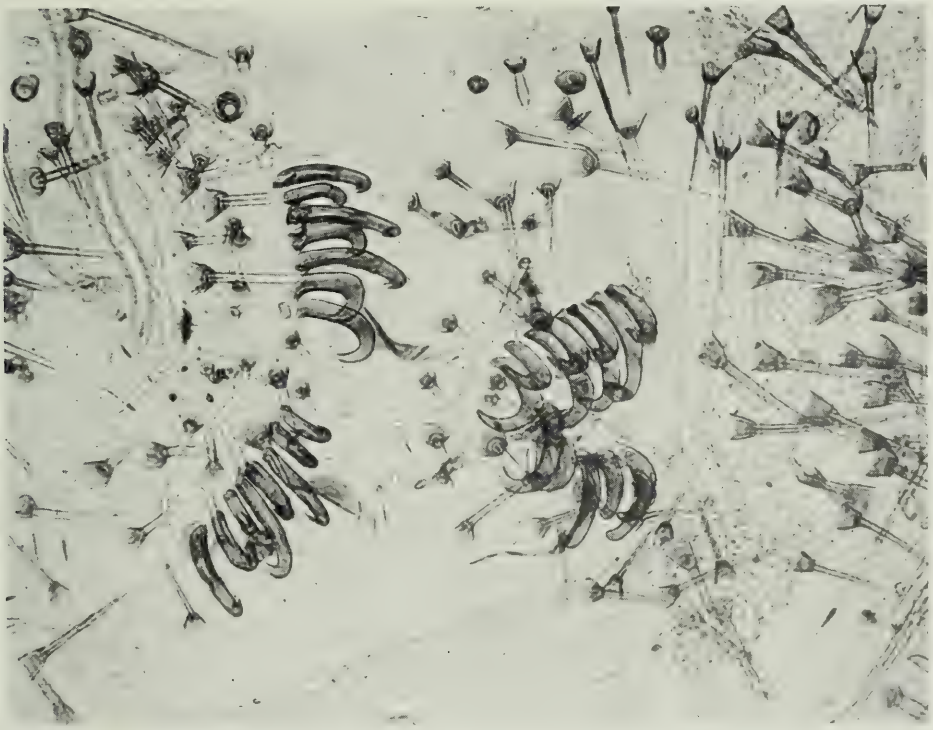
2. THE SPIRACLE AND LENTICLES OF THE 2ND ABDOMINAL SEGMENT (RIGHT SIDE) OF THE LARVA OF CUPIDO MINIMUS, LAST INSTAR × 150.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 124.]



THIRD PAIR OF LEGS OF LARVA OF CUPIDO MINIMUS IN LAST INSTAR × 100.



PROLEGS OF FIFTH ABDOMINAL SEGMENT OF LARVA OF CUPIDO MINIMUS IN LAST INSTAR—RIGHT SIDE PADS CLOSED, LEFT SIDE PADS EXPANDED × 150.

LARVAL STRUCTURE OF CUPIDO MINIMUS.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 124.]

tortoise, the head being very small and retractile, and a lateral ridge running all round, and giving the appearance of an upper shell. The prothorax is the longest segment, and has a sort of triangular plate on its middle, and the last three segments are slightly depressed. The inner rows of dorsal tubercles are rather projecting, and thus form between them a sort of dorsal hollow; the second row has already been noted as affecting the subdorsal line (Hellins).

Variation of larva.—Hellins observes (*Ent. Mo. Mag.*, vii., p. 186) that, after the first moult, there is some little variation in colour in different individuals, some being more of a pinkish-brown, others more of a chocolate colour ; the distinct dorsal stripe, of a deeper tint than the ground colour, and commencing as a broad triangular mark on the mesothorax, becomes gradually narrower up to the 7th abdominal, where it widens out into a lozenge-shape, contracting again to a narrow stripe on the 8th and 9th ; the tubercles show paler than the rest of the ground colour, because the brown hairs on them being divergent allow more of the paler skin to be seen. Just below the second row of tubercles comes the subdorsal line, which is, in fact, composed of a series of dark brown dashes, one on each segment sloping backwards and downwards so as to let the tubercle stand out in high relief ; along the edge of the lateral ridge runs a whitish stripe, which is continued round the anal extremity ; the belly and legs of the same colour as the back. The whole skin is studded with short bristles of a dark brown colour ; the head is black and polished, but with a streak above the mouth, and also the base of the papillæ, yellow. After this, and in the later instars, there is no change of appearance, save that of growing paler and more unicolorous (perhaps, as the bulk increases, more of the paler skin shows between the dark bristles), until some specimens are of an ordinary flesh-tint, and others of a brownish flesh-colour, and at this point the larvæ assimilate well with the changing colour of the corolla of their foodplant. After they cease feeding they turn to a faint greenish-yellow. Chapman observes (*anteà*, p. 119) that a number of fullfed larvæ that he obtained at Glion in July, 1908, were identical in markings, but these were faint in some very pale specimens that one is almost tempted to call white, whilst other larvæ were of a red-brown in which the markings were pronounced. Some two dozen which were sent to us from Glion were noted on July 12th, 1908, as varying considerably in ground colour, the greater number being pale greenish in ground colour, others greener towards the anterior part of the body, yellower on the dorsum and towards the posterior part, whilst others again incline to orange over the whole area, but much modified in their general appearance by the thick coating of little black hair-bases with which they are covered, and which are particularly effective when the segments are contracted. All the larvæ have a reddish mediodorsal line (sometimes inclining to orange, at others to pink), on either side of which is a faint, similarly-tinted, subdorsal line, suggesting depressions in the centre of each segment where the colour is most effective. The reddish supraspiracular line may be looked upon as a series of backward-directed oblique lines from the mesothorax to the 6th abdominal if looked at laterally, but, looked at dorsally, has all the appearance of a continuous crenate or wavy line over these segments. The rather less strongly-coloured subspiracular line is the edge of the lateral flange, on the upper edge of which are the tiny black spiracles, and the lower edge of which is let flat down on the resting-surface when the larva is at rest. In some larvæ the red tinge of these lines is very prominent, in others it is markedly faint. The venter is much paler than the dorsum, the thoracic area inclining to green, the abdominal to yellow, the unicolorous prolegs aiding the pallid appearance. In some of the orange-coloured specimens the general colour seems to have been caused by the spread of the red, faintly, over the whole area; in some of these the darker red on the orange ground is very effective. There are notes by other observers suggesting considerable variation in the colours of the larvæ in their last instar, *e.g.*, the fullfed larva is ·5 inches long, to the unaided eye brownish-yellow in colour, with a narrow, dark longitudinal line down the back, and above the flange a similar very weak line, which is bordered below with a white one, and broken in the intervals between the segments. The head is, as in all Lycænid larvæ, very small, shining dark brown, like the thoracic legs. The whole body is covered with short hairs, which with a lens are seen to stand on dark dots (Schläger *teste* Zeller, *Stett. Ent. Zeitung*, 1877, p. 294). The fullgrown larva, of woodlouse form, is about six lines long, anteriorly narrower, posteriorly flattened. The colour of the body is bone-yellow, more rarely brownish-white. Head very small, shining dark brown, paler round the black forked line; it is, while at rest, entirely withdrawn into the prothorax, through which it appears as a grey spot. Along the side of the greasy-looking dorsal line are undulating lines which become identical with the ground colour before the pupal change; below the reddish-brown spiracles runs a somewhat lunulated white line; the posterior segments are sometimes tinged with greenish. The upper part of the body is densely covered with short, fine, brownish hairs, in consequence of which the colour of the body assumes a dirty appearance. Legs dark brown, venter yellowish-white. I came across certain larvæ which were coloured canary-yellow; others again, had a flesh-coloured dorsal line, and in some individuals this line, the oblique lines, and the 2nd and 3rd segments were tinged with rosy red. If one compares this larval description with that of Herr Wilde in the second part of "*Die Pflanzen und Raupen Deutschlands*," such essential differences are exhibited that it leaves room for the supposition that that author was led into error by some circumstance, and that some other larva was described by him as that of *alsus*.[*] As foodplants, the allied *Coronilla*, *Melilotus*, and others, are noted without special remark as to which part of the plant the larva takes for its nourishment (Gärtner, *Berl. Ent. Zeits.*, 1865, p. 115).

Foodplants.—*Anthyllis vulneraria* (Hellins), [*Ornithopus perpusillus* (Postans), wants confirmation,] *Astragalus glycyphyllos*, *A. cicer* (Hübner, Zeller, Guenée), *Coronilla varia* (Bartel and Herz), *Coronilla minima*, *Trifolium procumbens*, *Melilotus arvensis*, *M. officinalis* (Frionnet), *Melilotus* (Schultz), *Trifolium*, *Coronilla* (Rouast), *Colutea arbores-*

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[*] Wilde's description (*Sys. Besch. der Raupen*, p. 45) is as follows: "*Alsus*, dirty green, with a reddish, yellow-bordered, dorsal stripe, similarly coloured and bordered oblique stripes, and a yellow lateral line above the legs; head grey-green, with two black spots. 4 L. Pupa greenish-yellow, with four rows of black dots on the back. Lives in June and in August on *Coronilla*, *Melilotus*, and other plants. Imago in May and July in dry upland meadows."

cens, seedpods (Aigner-Abafi), *Sanguisorba* seedheads (Szépligeti), *Onobrychis sativa* (Bromilow), *Lathyrus pratensis* (Paux).

PARASITES.—*Limneria sordida*, Gr., and *Mesochorus confusus*, Hlmgrn. (W. H. B. Fletcher).

PUPARIUM.—On June 10th, 1906, on the Cotteswolds, at 800ft. elevation, I discovered a newly-emerged imago of *C. minimus* resting directly above its vacated pupa-case; the latter was on a dried grass-stem about ·5in. from the earth and surrounded by the usual herbage of the locality; the head of the pupa pointed upwards, and there appears to be a silken thread or its remains, indicating its mode of attachment (C. J. Watkins). There is no indication of the mode of attachment of Zeller's two pupæ in the British Museum collection, but the structure of the cremaster leaves one with a very strong impression that it uses the well-formed hooks for suspension (Tutt). About the end of August, 1872, about a dozen larvæ prepared for hybernation, in confinement, each spinning a silken webbing on the leno, and resting thereon; disturbance, however, caused the death of all the larvæ but one, and on June 3rd, 1873, this larva pupated, being neither suspended by the tail, nor had it any silken cincture, and it might very well have been passed over as a stony particle on the chalky soil of Portsdown Hill, whence came the larvæ (Buckler).

PUPA.—The pupa is nearly 8mm. long, and 3mm. wide at the mesothorax, almost straight on the venter, well domed on the dorsum, with a distinct waist-like depression where the summit of the mesothorax falls to the metathorax; the front is well rounded, with some prominent and comparatively long hairs, the anal segments from the 7th abdominal turned round sharply to end at the cremaster, which is in a line with the venter. The skin is greyish-white, almost transparent, and thickly sprinkled with dark brown dots of varying size; the body (except the appendages and wings) with a plentiful supply of longish, conspicuous hairs. *Dorsally:* the prothorax almost frontal; the mesothorax raised into a dome with a longitudinal, median, dark brown ridge, the areas on either side to wing-bases speckled with small red-brown dots, many of which coalesce into a blotch towards the front, corresponding in series with those on the other segments, the shiny, glossy (apparently spiculate) hairs abundant; the metathorax curving up in the front at either side into the mesothorax, narrow medially, speckled with brown, a largish blotch at front upper corner on either side, the dorsal ridge extending from the mesothorax over this segment, the hindwing only traceable in a small area at base; the hairs frequent as on other segments. The 1st abdominal segment short and narrow, apparently smooth, and with fewer conspicuous hairs, a dark mark as a continuation of the median line, and a very strongly-developed, rounded blotch at each end laterally (against the wing-margin); the 1st, 2nd, 3rd, 4th, and 5th abdominal segments form first an ascending, then a descending series in size, the 3rd being the largest; on each is a distinct, dark, lineated, mediodorsal mark, that would be a mediodorsal line, but that it is broken by the swollen subsegmental incisions; a conspicuous series of round dark spots on either side (subdorsally and supraspiracularly) one on each segment; the hairs on large bases are difficult to group as i, ii, and iii, which appear to be overshadowed by the development of many secondary hairs; the 6th, 7th, and 8th abdominal segments decrease regularly in size, have the dark markings much less strongly developed (in one pupa the dorsal and lateral spots are all absent on the 7th and 8th), but the hairs exceptionally long. The 9th and 10th abdominals form a single large plate, somewhat curved under the 8th abdominal, and ending, as it were, on the back ventral edge as an edging of stiff bristles belonging to the cremaster, the setiferous bristles, however, still long, serrate, and well-developed. The amount of brown speckling on the surface of the skin varies greatly; in one of the two examples examined (Zeller's in the Brit. Mus. coll.) the speckling is abundant, in the other, almost entirely wanting. *Laterally:* One obtains on lateral view the best idea of the outline of the pupa, the somewhat straight venter with a slight falling in at the wing-apices, and the doubly-domed dorsum hollowed at the metathorax so as to separate the thoracic and abdominal areas; the abundant hairs of the segmental surfaces stand out strongly in profile, showing how peculiarly the hairs are restricted to these segmental areas, whilst the wing-surface is smooth. A conspicuous ridge runs from the upper edge of the mesothorax along the inner margin of the wing, branching off on the outer margin just above the anal angle, and continuing to the cremaster as a spiracular ridge, the inconspicuous spiracles being detected on the upper edge thereof as soon as it leaves the wing; there is an abundance of setiferous hairs in this flange area, possibly those belonging to iii as well as iv and v; the short, curved (hooked) cremastral hairs form a dense little mass sticking out ventrally (looked at thus in profile). The wing occupies a very large area, viewed laterally; the wing-membrane is very thin and transparent, the nervures very pale; in one example the interneural spaces are thickly filled with brown speckling from shoulder to "Poulton's line," so thickly as to make the brown quite linear in appearance, in the other so sparse as only to mark off the neural lines. *Ventrally:* Frontally, the prothoracic hairs stand out conspicuously, the frontal head-piece also hairy; the face-parts all clearly marked; the antennæ, rather darker than the surrounding parts, come round from the frons in contact with the costa of the wing, and end at the wing apex; the glazed eye transparent, very distinctly marked; the maxillæ continued until the antennæ meet in the median line, when they disappear beneath; the space between the maxillæ and antennæ filled up with bases of true legs; the wing-surfaces, legs, and mouth-appendages, smooth; the wings end on the 5th abdominal segment, which together with the 6th and 7th form narrow bands ventrally, the 8th being buried; the anus, which appears to terminate the combined 9th and 10th abdominals, is posteriorly edged by the cremastral hooks. [Described February 6th, 1909, from two ♀ pupa-shells in Brit. Mus. Coll., labelled "Zell. Coll.," and from which the imagines emerged May 13th, 1856, from larvæ found at Jena.] (Tutt). Length rather over a quarter of an inch; width less than one-eighth of an inch; in figure, when viewed in front, a long ellipse, but sideways, the rather prominent head, the rounded thorax, and swelling abdomen, with its blunt tip curved under, give a much more irregular outline; the wing-cases straight, long in proportion, well-developed, but rounded off at the angles; the upper or back surface sparsely set with fine hairs. The colour a dirty whitish-grey, approaching drab, more greyish on the head and thorax, paler on the abdomen; there is an interrupted dorsal stripe of black, and, on either side, a lateral row of short, oblique, black dashes; the nervures of the wings are well-shown by the spaces between them being filled up with dark grey; the hairs are whitish, and the whole surface is sprinkled with some minute black dots. [Described from a fresh pupa, after the colours had settled, June 3rd, 1873.] (Hellins, *Ent. Mo. Mag.*, x., p. 43). The same pupa was then sent on to Buckler, who described and figured it, just before the emergence of the imago. His description reads: 3·5 lines in length, 1·5 lines in diameter, moderately plump in appearance, the head and thorax well-defined, the tip of the abdomen blunt and rounded. When viewed in front, its general form is that of a narrow ellipse, but when seen sideways the prominent swelling of the thorax and the tip of the abdomen bent under, with the long wing-cases, give the usual appearance of the pupæ of this group. The colour of the pupa is dirty whitish-grey, approaching to drab, palest on the back of the abdomen, greyish on the head and thorax, both of which are marked with a black dorsal stripe, which is a little interrupted; on either side is a subdorsal row of short, slanting, black dashes. The pale ground-colour is sprinkled with some very minute, black specks. The wing-nervures are well-defined by the spaces between them being filled up with dark grey. The head, thorax, and abdomen are hairy, with bristly whitish hairs, of which there are none on the wing-, leg-, and antenna-cases. [Described from the pupa noted above, some little time before emergence, which took place June 24th, 1872.] (Buckler, *Larvae Brit. Butts.*, i., pp. 103-104). Buckler's figures of the pupa (*op. cit.*, pl. xiv., figs. 2*f*) are most unsatisfactory, possibly due to the reproduction. The dorsal view gives no true ideas of the lateral flange formation, the rounded (or domed) development of the thoracic segments, or even the nature of the dark dorsal line, and subdorsal rows of spots. The lateral view is equally unsatisfactory; the thoracic dorsum being very poorly developed, whilst the oblique markings on the wing are quite unlike the real interneural lines (of which there are several) leading from the base to the outer margin of the wing. Lastly, the dorsal view of the pupa, and, more particularly, the lateral, give a panoply of long setiferous hairs which stand out conspicuously, but Buckler's figures show no sign of these hairs which are so characteristic, not only of this, but of all Everid pupæ (to which tribe *Cupido minimus* belongs).

Time of appearance.—The species appears to be essentially single-brooded in Britain, appearing in late May and June, but with a tendency for the earliest summer larvæ to become "forwards," and produce a small partial second-brood in August in specially fine seasons. The same habit seems to prevail in the plains and hills of central and southern Europe, but, in the higher altitudes and latitudes, the species is absolutely single-brooded, and usually emerges in July and August. There is, however, considerable difference in various seasons, as to the emergence of the main brood, whilst, in some years, the first brood continues throughout June, and even to early July. In other years it is out in late May, over in early June, and the partial second-brood is out before July is past. In the fine summer of 1887, worn specimens were captured on the cliffs at the South Foreland as late as July 11th, whilst, in the same place, between August 5th and 10th, of the same year, specimens of an undoubted partial second-brood were more abundant than had ever previously been noted, yet there is no doubt that, in the wet and cold year following, the July and August examples taken in the same place were of the first and, for that year, only brood. Some British localities appear never to produce any second-brood examples, *e.g.*, Watkins states that such are never seen on the Cotteswolds, whilst in other places the species is only noted in the spring brood, *e.g.*, in May in the Cowran Hills near Carlisle (Armstrong); locally common in May and June in Roxburghshire (Renton); early June at Witherslack (Forsythe); abounds, at the end of June, at Black Head, Clare (Lawless), etc. The following dates of the capture of specimens taken in the British Isles should prove instructive:—May 30th, 1856, near Bristol (Naish); June 1st, 7th, 1856, on the hills near Dover (Harding); June 28th, 1856, at Llanferris (Gregson); June 1st, 7th, 1857, at Leckhampton and Birdlip (Merrin); June 2nd, 1857, at Amesbury (Rogers); June 2nd-3rd, 1857, on the Hilly Field, Box Hill, June 5th, 1857, near Dorking (Trimen); June 2nd, 1857, and preceding days, at Weston-super-Mare (Head); July 13th-27th, 1857, at Wotton-under-Edge (Perkins); August 6th, 1857, in Flem Dyke at Fulbourn, near Cambridge (Farren); June 10th, 1858, in Scotland (White); June 11th, 1858, in Bramham Park (Oates); June 14th, 1858, near Dover (Harding); June 15th-22nd, 1858, at Folkestone (Drury); July 10th-12th, 1858, at Ram Heugh, near Stonehaven (Thomson); May 27th-June 5th, 1859, at Oban (*E.W.I.*, vi., p. 182); May 31st, 1859, at Kirriemuir, very common (F. B. White); June 1st-10th, 1859, near Worcester (Edmunds); June 8th, 1859, near Croydon (Rogers); June 13th, 1859, near Deal (Harding); June 13th-20th, 1859, at the Bridge of Allan (Wingate); June, 1860, at Galway (Barrett); July 3rd, 1860, in Trench Woods (Edwards); July 30th, 1860, near Carisbrooke Castle (Adams); June 9th-16th, 1861, at Dursley (Merrin); June 22nd, 1861, at Hollingbury Hill (Jones); August 24th-September 1st, 1861, at Torquay (Stewart); June 27th, 1866, abundant near Cambridge (Gedge); September 1st, 1866, at Niton, Isle of Wight (Cruttwell); June 15th, 1867, in Scotland (White); June 22nd, 1867, near Lewes (Jones); May 27th, 1868, at Cirencester (Harman); July 24th, 1868, on the Cotteswolds (Watkins); June 5th-26th, 1869, at Brockenhurst (Capper); June 8th, 1869, at Cirencester, abundant (Harman); May 27th, 1870, on the Cotteswolds (Watkins); June 5th-15th, 1873, at Halling (Tutt); June 2nd, 1876, at Caterham (West); June 15th, 1876, at Abbotts Wood (Dale); July 4th, 1876, near Powick (Fletcher); June 29th, 1878, on Stinchcombe Hill (Spiller); May 29th, 1880, at Cuxton (Bower); June 2nd, 1880, at Killybegs, Co. Donegal; June 14th-20th, 1880, in Merlin Park (J. J. Walker); August 4th, 1881, Isle of Purbeck (Bankes); May, 1882, at Sligo (Russ); June 20th-30th, 1882, at Eastbourne (Wright); July 5th-26th, 1882, at Folkestone (Salwey); July 11th, 1882, near Clevedon (Jeffreys); July 6th-20th, 1883, at Witherslack (Rose); July 7th, 1883, in the Dover district (Coverdale); May 30th-June 1st, 1884, at Witherslack (Hodgkinson); June 23rd, 1884, in the Isle of Purbeck (Bankes); June 12th, 1885, near Basingstoke (Hamm); June 23rd, 1885, common on the cliffs at Holywell, near Eastbourne (Hawes); June 15th, 1886, near Basingstoke (Hamm); June 19th, 1886, at Horsley (Helps); June 26th, 1886, in the Isle of Purbeck (Bankes); July 21st, 1886, out of condition at Shoreham (Bower); June 6th, 1887, in the Isle of Portland (Bankes); June 15th, 1887, at Box Hill (Bower); July 11th, 1887, worn, at the South Foreland, August 5th-10th, 1887, fresh and more abundant than the partial second-brood had ever been previously noted (Tutt); June 22nd, 1888, at Caterham (Bower); July 6th-9th, 1888, a very cold and late season, at the South Foreland, August 8th, 1888, at Kingsdown (Tutt); June 5th, 1889, in the Isle of Purbeck (Bankes); just appearing May 24th, 1890, at Portland (Brown); May 29th, 1890, in the Isle of Purbeck (Bankes); May 30th, 1890, at Witherslack (Massey); one just emerged May 31st, 1890, at the South Foreland (Tutt); June 2nd, 1890, at Watergate(Christy); June 7th, 1890, at Bristol, and still in fresh condition at Dursley on June 24th (Prideaux); exceedingly abundant June 24th, 1890, on the Cotteswold Hills, near Dursley (Griffiths); June 28th, 1890, at Worlington (Norgate); July 2nd and 3rd, 1890, at Dorking (Nicholson); June 9th, 1891, at Dursley (Prideaux); July 6th, 1891, in the Deal district (Fenn); May 30th-June 6th, 1892, at Watergate (Christy); June 2nd-12th, 1892, at Eastbourne (Tugwell); June 10th, July 16th, 18th, 1892, in the Isle of Purbeck (Bankes); June 18th-26th, 1892, at Folkestone (James); July 29th-August 1st, 1892, at Swanage (Bloomfield); one August 21st, 1892, at Folkestone (Adkin); May 26th, 1893, at Witherslack (Crabtree); June 9th, 1893, at Swanage (Freir); June 10th, 1893, at Watergate (Christy); June 15th, 1893, at Dorking (Battley); June 18th, 1893, at Hereford (Chapman); June 9th, 1894, at Reigate (Turner); July 10th-25th, 1894, at Stonehaven (Dalglish); May 24th, 1895, common at Wreay (Wilkinson); May 27th, June 9th, a very fresh ♂, July 22nd, 1895 (second-brood ?), at Carisbrooke (Prideaux); June 8th-24th, 1895, at Cuxton (Tutt); abounded in Glen Lochay in June, 1895 (Morton); June 26th, 1895, worn, on the sea braes of Fife (Evans); May 25th, 1896, at Ripley (Simes); May 26th, 1896, at Folkestone (Page); June 5th-26th, 1896, in the New Forest (Capper); June 6th, 1896, at Reigate (Prideaux); June 28th, 1896, at Cuxton (Tutt); July, 1896, in the Warren, Folkestone (Battley); August 17th, 1896, in the Reading district (Hamm); May 23rd, 1897, at Ashford (Wood); June 7th, 1897, common at Wreay (Wilkinson); June, 1897, in abundance at Carlisle (F. H. Day); June 26th, 1897, at Cork (Donovan); June 26th, 1897, on the Chiltern Hills, common (Rowland-Brown); between August 5th-September 9th, 1897, at Swanage (Hall); June 11th, 1898, at Dorking (Prideaux); June 11th, 1898, at Reigate (Turner); June 19th, 1898, at Horsley (Bell); June 23rd, 1898, at Broadway, Worcester, July 16th, 1898, June 19th, 1898, at Horsley (Bell) ; at the Slads (Edwards); July 2nd, 6th, 1898, in the Warren, Folkestone (Heitland); July 14th-21st, 1898, in the Devils Dyke (Peed); August 1st-6th, 1898, at Land's End (J. E. Gardner); several August, 1898, on the top of the hill between Swanage and Durlston Head, fully as large as spring specimens (Griffiths); September 6th, 1898, at Caterham (Bower); May 31st-June 25th, 1899, at the Slads, Worcester (Edwards); June 3rd, 1899, on Aldbury Down (Barraud); June 4th, 1899, at Reigate (Prideaux); June 12th-26th, 1899, at Tenby (Fox); June 19h, 1898, at Hosley (Bell) ; July 9th, 1899, at Dorking (Carr); July 27th, 1899, at Shoreham (Bower); June 4th, 1900, near Guildford (Pickett), June 9th-14th, 1900, at Eynsford, August 3rd, 1900, in some numbers;, and in fine condition, in west Hertfordshire (Barraud); June 10th and 11th, 1900, at Shoreham, Kent (Carr); June 11th, 1900, abundant on Beachy Head (Blenkarn); June 11th, 1900, at Shoreham (Bower);

June 17th, 1900, at Reigate (Prideaux); June 22nd, 1900, at Westwell (J. E. Gardner); July 7th, 1900, at Horsley (Bishop); July 17th, 1900, at Ashford (Wood); June 5th, 1901, at Reigate (Prideaux); June 13th-16th, 1901, at Westwell (J. E. Gardner); June 22nd, 1901, at Stockton (Garrett); June 28th-July 4th, 1901, plentiful, and in fine condition near Dorking (Oldaker); June 29th, 1901, and August 1st, 1901, at Shoreham (Bower); August 3rd, 1901, on Aldbury Down (Barraud); one on August 5th, 1901, after being quite common in June, in the Caterham Valley (Seth-Smith); June 21st, 1902, at Reigate, still observed (not fresh) July 30th (Prideaux); June 22nd-28th, 1902, at Westwell, July 29th, 1902, in Kincardineshire (J. E. Gardner); June 24th, 1902, at Dorking, the first seen this year (Oldaker); June 24th, 1902, at Shoreham (Bower); June 26th, 1902, at Enstone (Cruttwell); June 26th-29th, 1902, around Kingsdown and Martin Mill (Carr); July 3rd, 1902, at Swanage (Robinson); June 27th, 1902, on Aldbury-Down, August, 1902, second-brood at Tring (Barraud); August 11th, 1902, on the South Downs between the rivers Adur and Arun (Bird); August 17th, 1902, at Dover (Pickett); June 2nd, 1903, at Folkestone, August 8th, 1903, at Dover (Pickett); June 6th, 1903, at Horsley (Lucas); June 16th, 1903, at Reigate (Prideaux); June 22nd, 1903, at Dorking (Oldaker); June 22nd, 1903, at Enstone (Cruttwell); June 26th, 1903, at Westwell (J. E. Gardner); June 27th-July 2nd, 1903, on the South Downs between the rivers Adur and Arun (Bird); July 11th, 1903, at Wendover (Turner); June 4th, 22nd, 27th, 1904, in the Isle of Purbeck, June 17th, 1904, at Blandford, June 24th, 1904, in the Isle of Portland (Bankes); June 17th, 1904, at Dorking (Oldaker); July 6th, 1904, at Witherslack (James); May 25th, 1905, at Stroud (Watkins); June 1st, 1905, at Tring (Rothschild); June 4th, 1905, at Reigate (Prideaux); June 10th, 1905, at Dorking (Oldaker); June 12th-13th, 1905, at Westwell (J. E. Gardner); June 14th, 1905, at Reigate (Image); June 23rd, 1905, in the Isle of Purbeck (Bankes); June 24th, 1905, at Reigate (Turner); June 25th, 1905, at Lewes (Sheldon); June 30th-July 7th, 1905, at Witherslack (Shuttleworth); June 9th, 1906, on the Chiltern Hills, common (Rowland-Brown); June 10th, 1906, on the Cotteswolds (Watkins); June 17th, 1906, on Aldbury Down (Barraud); July 14th, 1906, at Horsley (Kaye); July 16th, 1906, common, on August 10th, 1906, at Newbury, fresh (Hopson); several second-brood examples on August 6th, 1906, at Streatley, near Reading, the first-brood had been fairly common in June (Butler); several examples August 16th, 1906, on the Devil's Dyke, near Newmarket (Keynes); one example about August 20th, 1906, on the Devil's Dyke, Cambs. (Fryer); June 8th, 1907, on the Downs near Eastbourne (Smallman); June 9th, 1907, at St. Margaret's Bay (Thornthwaite); June 9th, 1907, on the Chiltern Hills, common (Rowland-Brown); June 28th, 1907, common at Freshwater (Wright); June 8th, 1908, at Folkestone (Pickett); July 2nd, 1908, a single worn ♂ on the Chiltern Hills (Rowland-Brown). In Germany the species appears to be partially double-brooded, as in Britain. It is only noted as occurring in June in East and West Prussia (Speiser); in July, in Pomerania (Hering); in May and June, in Holsatia (Saxesen); the end of May to mid-June, in Waldeck (Speyer); June and July, in Anhalt (Richter); June and July, in Brandenburg (Bartel and Herz); but in other districts two broods are mentioned or assumed, *e.g.*, end of June, and a single example once on August 17th, near Friesland, in Mecklenburg (Stange); in the Rhine Provinces at least partially double-brooded, May and July at Crefeld, the first-brood much more abundant than the second (Rothke); partially double-brooded, occurring in June and August at Wiesbaden (Prideaux); in May, and throughout the whole summer, in Baden (Gauckler); early May, and again in July, in Hesse (Rössler); May-June, and again in July-August, in Thuringia (Krieghoff); May and August, in the Hartz (Fischer); April-May, and again in July, in the Trebnitz mountains in Silesia (Döring); but at Bitke, from June 10th-30th, and not double-brooded (Nohr); May, and again in July, are noted for the Kingdom of Saxony (Steinert); May, and end of July, in Bavaria (Schmid); sometimes the first brood as early as the end of April (Kranz). In the south of Finland it appears to be only single-brooded, occurring in May and June (Federley); in May and June, in Scandinavia (Wallengren); but in the Netherlands, May and July are recorded (Snellen); and in Belgium, May-June, and August-September (Lambillion). In Austria, the insect is considered to be generally double-brooded, occurring in April and July (Höfner), these months being given for Salzburg (Richter); it is noted in May and July, in Bohemia (Nickerl), and in May-June, and July-August, in Upper Austria (Himsl); whilst in Lower Austria, Fritsch gives April (21st)-May (6th), and notes a partial brood as late as October (12th-13th), he also gives April-May and July for the Tyrol; April-May and July-August for Styria (Höfner), where also, May, June, and early July are given for the Styrian Alps (Kiefer); May to mid-June, and from mid-July to end of August in Croatia (Grund). In Hungary it is stated to be double-brooded, *viz.*, early May to mid-June, and end of June to early August (Aigner-Abafi). In Bosnia and Hercegovina it appears to be double-brooded (Rebel). In the Baltic Provinces, it occurs from mid-May through June, into July (Nolcken). In Switzerland occurs as two broods April-June, and in August, in the lowlands, but single-brooded in July to August, in the mountains* (Wheeler); occurs in May in Ticino, at Locarno (Chapman), but in the mountains at Piora, just emerging in early August (Tutt); in the Geneva district it occurs in April, but is abundant in May, and occurs up to July (dates from April 9th-July 17th) (Blachier); in the Albula Valley it was in great plenty on May 24th in the Tuorsthal, and common in the meadows until July, and throughout the latter month at Weissenstein, in 1871, 1874, and 1875 (Zeller), whilst it still occurred on August 18th-19th, 1907, at Weissenstein (Tutt), and on July 11th, 1878, at the head of the Albula Pass, surrounded by unmelted snow (Elwes). The times of appearance in Southern Europe are not recorded with any exactness. In Portugal, in the Setubal district, April, and then July and August are noted (Vielledent). In Spain, it has been so rarely recorded that one is unaware whether it is double-brooded or not; rare in June in Teruel (Zapater); July in the Asturias (Oberthür). It has been recorded for July in Corsica (Rowland-Brown). In Italy, in Tuscany, double-brooded, May and July (Stefanelli); May, in Sicily (Minà-Palumbo); May, in Naples, Capri, etc. (White); early June (Oberthür) and July, at Como (White); from commencement to end of June, in the Chiasso district (Knecht); mid-June (Rowland-Brown) and early August, at Susa (Tutt); May and June, at Varallo and Orta (Lowe); July at Turin (Swinton); July in the Pistoiese Apennines (Verity); whilst successive broods in the summer of 1892, are recorded at the Certosa di Pesio (Norris). In France, it would appear to be largely single-brooded in the north and central departments, but more or less double-brooded in the south, *e.g.*, Godart says that it occurs in May and July in the southern departments of France, whilst Duponchel states that it is double-brooded in central France as far north as Paris, occurring first in June, and then again in August. Millière also gives June and August for the Alpes-Maritimes, but the time of appearance here seems to be largely a matter of altitude, and less so a matter of latitude; Powell does not believe that, even in the most southern departments, it is double-brooded, but occurs from April to August according to altitude; he finds it in April in the valley near La Maunière, in the Hyères district, at 60m. altitude; in April at La Guiranne, at 150m.; in May, in the St. Pons Valley; in early June, worn, on Mont Pacagnalia, near Nice, at 600m.; at the end of June, on the Pic de Béguines, at 1154m.; worn, in early July, at Beauvézer, at 1200m., but fresh, a fortnight later, above the town, at 1800m.; mid-July, at Colmars, at 2000m., at Esteng, 1750m., at Entrevaux, 1200m.; and early August, on Mont Pélat, at 2300m. elevation. Rondou notes end of April to July, in the Basses-Pyrénées, but other authors give suggestions of double-broodedness—May, and again in August, in Indre (Sand); June, and again in August, in Saône-et-Loire (André), in Eure (Guenée), and in Vosges (Cantener); April to June, and again in July, in Haute-Marne (Frionnet); Basses-Alpes—April (Tutt), June (Jones), July, at Digne (Lemann); Gard—April, at Pont du Gard (Tutt); Savoie, early May and end of July, at Grésy-sur-Aix (Tutt), etc. In the French Pyrenees at Cauterets, Gavarnie, etc., it occurs in June and July (Oberthür); in the Hautes- and Basses-Alpes—Le Lautaret, Lanslebourg, Allos, Abriès, etc., in July and August (Tutt). In Roumania, it is recorded as triple-brooded, May-June, July and September (Caradja); in Transcaucasia, it occurs in May (Romanoff). In Scandinavia the time of appearance is given as May to July (Sparre-Schneider). The occasional collectors who have visited various parts of Asia, have recorded it as occurring in May, in Thibet (Grum-Grshmailo); June in the Altai (Elwes); end of July, in Amurland (Graeser); June and July, in Kamschatka (Alphéraky); but it is impossible to tell the number of broods in these countries. The following actual dates of capture may prove interesting—bred May 13th, 1856, from larvæ from Jena (Zeller); May 31st, 1863, near the ruins of the old church of Hamar am Mjösen (Wocke); in May, 1866, at Capri, in July, 1866, at Como (F. B. White); July, 1868, from Mödling (Zeller); July, 1869, in the Vallée d'Eyna

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* Chapman remarks (*in litt.*) on the fixity of the single-brooded habit of this species in Switzerland (and elsewhere). He writes: "Its date of appearance coincides with the time of flowering of *Anthyllis*. At Glion, 1908, the date of flight was probably mid-May, and in early July the larvæ were fullfed. Some hundreds of larvæ were taken and distributed to various correspondents, and some I kept myself, but not one of all these pupated in 1908; nor have I heard of any larva pupating the same year. In such a country as Switzerland, the butterfly has a long period of flight, extending to mid-August or later, at, or above, 6000ft., but that is the date of the flowering of *Anthyllis* at that elevation, and, though the butterfly is then on the wing, it was not so at that place any earlier; the flight for any one locality is not a prolonged one."

(Oberthür); April 12th, 1870, at Bex (Murray); May, 1876, at Naples (Oberthür); June 28th-July 5th, 1878, on the Riffelberg (Jordan); in July, 1878, at Turin (Swinton); July 8th, 1878, in the Val Fex, between 5500ft.-8500ft., July 11th, 1878, at the head of the Albula Pass (Elwes); July 13th, 1879, at Swinemund (Zeller); June 17th, 1880, on the Riffel Alp, at 8000ft. (Bethune-Baker); July, 1881 and 1882, at Cauterets, July, 1882, in the Asturias, on the Mont Picos de Europa (Oberthür); May 29th-30th, 1883, at Kreusnach, July, 1883, at Cauterets, July 13th, 1883, at Gavarnie (Oberthür); June 27th, 1884, at Axenfels, June 29th, 1884, on the Rhone Glacier at 6000ft. (Elwes); July, 1884, at Alveneu Bad, July, 1884 and 1885, at Pontresina (Lemann); May 25th, 1885, in Valais, at 3000ft., June 30th, 1885, at Maloja, at 6000ft. (Elwes); worn June 1st-5th, 1886, at Brünnen, fine mid-June, 1886, at Andermatt, 3000ft. higher (Jones); May 9th, 1887, between S. Maurice and Lavey, May 18th, 1887, at Brünnen, very abundant (Hutchinson); June 29th-July 11th, 1887, at Vernet, July 12th-19th, 1887, at Bagnères de Luchon, July 20th, 1889, at St. Sauveur, July 21st, 1887, at St. Jean-de-Luz, 2000ft. (Elwes); July, 1887, at Vernet-les-Bains (Oberthür); May 12th, 1889, on Mont Condon, near Hyères (Norris); May 1st, 1890, at Martigny (Blachier); May 17th, 1890, at Amdo, Thibet (Grum-Grshmailo); June 5th, 1890, at Digne (Jones); June 26th-July 6th, 1890, at Engelberg, July 9th-15th, 1890, at Engstlen (Bethune-Baker); July 26th, August 18th, 1890, at Cauterets (Oberthür); July, 1891, at Digne, June, 1892, at Budapest (Lemann); July 1st-8th, 1892, at Chamonix, July 10th-16th, 1892, on the Riffelberg (Oberthür); July 22nd, 1892, at Runglstein (Rebel); June 8th-21st, 1893, in the Wolfsthal (Nicholson); June 15th-25th, 1893, at Cauterets, June 27th, 1893, at Gavarnie (Oberthür); May 7th, 1894, at Villeneuve (Reverdin); June 17th, 1894, on the bastion of the Courbière fort, near Graudenz (Riesen); July, 1894, at Vernet (Lemann); July, 1894, at Lanslebourg (Oberthür); August 6th, 1894, above Saas-Fée, on the Langeflüh (Rowland-Brown); June, 1895, at Uriage (Oberthür); July 16th-25th, 1895, at Péjo and Campiglio (Lemann); July 29th-30th, 1895, on the Mendelstrasse (Tutt); May 25th-29th, 1896, in the Belgian Ardennes (Bath); June 7th, 1896, near Bruchsal (Gauckler); July 25th, 1896, at Randa (Reverdin); July 30th-August 5th, 1896, at Le Lautaret (Tutt); August 12th, 1896, between Useigne and Evolène (Rowland-Brown); April 6th, 1897, at Veytaux (Wheeler); just emerging April 16th-29th, 1897, at Digne, May 6th, 1897, at Grésy-sur-Aix, August 11th-21st, 1897, at Susa (Tutt); May 1st, 1897, at Grésy-sur-Aix, August 1st, 1897, at Innsbruck (Chapman); May 8th, 1897, at Le Paradis, near Costebelle (Buckmaster); July 9th-13th, 1897, at Villach, etc. (Lemann); July, 1897, at Allos, July, 1897, at Enchastrayes (Oberthür); July 31st, 1897, in the Göschenen-Thal (Tutt collection); April 21st, 1898, at the Pont du Gard, July 26th, 1898, at Grésy-sur-Aix (Tutt); April 28th, 1898, in the Val d'Ombla, near Ragusa, June 7th, 1898, at Jablanica (Nicholl); June 20th, 1898, in the Tchuja Valley, south-east Altai, 4000-6000ft. (Elwes); June 28th-July 7th, 1898, in the Bernese Oberland, July 8th-18th, 1898, on the Riffelberg (Oberthür); July 8th, 1898, at Harstad (Chapman); April 3rd, 1899, at Veytaux, August 6th, 1899, at Bérisal (Wheeler); June 4th, 1899, at Digne, June 20th, 1899, at Susa (Rowland-Brown); June 18th-23rd, 1899, at Digne, June 28th-July 7th, 1899, at St.

Martin-Vésubie (Lang); July 1st-13th, 1899, near the summit of the Gemmi Pass (Rosa); July 1st-12th 1899, at Fusio, July 28th-August 6th, 1899, at Simplon, in good condition, very small examples, August 4th-12th, 1899, at Evolène, of large size, August 11th, 1899, on the Col du Torrent, August 12th, 1899, in the Ferpècle Valley (Tutt); July 15th-August 25th, 1899, in the Brenner district (Galvagni); August, 1899, at Arolla with *Erebia glacialis* (Chapman); May 12th-June 16th, 1900, at Varallo and Orta (Lowe); June 4th-10th, 1900, at Digne, July 9th, 1900, at Chiesa, July 16th, 1900, on the Stelvio (Rowland-Brown); June 21st-25th, 1900, at Salzburg, June 26th-28th, 1900, at Berchtesgaden, June 29th-July 2nd, 1900, at Mödling, near Vienna, July 3rd-9th, 1900, at Budapest (Lang); July 1st-21st, 1900, at Pontresina, July 23rd-30th, 1900, at Guarda (Chapman); July 7th-21st, 1900, on the Simplon Road (Rosa); July 17th-25th, 1900, at Cortina, July 27th-30th, 1900, at Brenner (Jones); July 21st-August 9th, 1900, in the Brenner district (Galvagni); August 6th-12th, 1900, at Abriès, and on the Crête de Reychasse, near Abriès (Tutt); June, 1901, in Bosnia (Elwes); end of June, 1901, Sospel to Pieracore, July 14th, 1901, at Gavarnie (Oberthür); June 20th-25th, 1901, at Bozen (Lowe); July, 1901, at Zermatt (Lemann); July 3rd-8th, 1901, at Beauvézer, at 1200m., July 19th, 1901, above Beauvézer, at 1800m., July 13th, 1901, above Colmars, at 2000m. (Powell); July 18th-25th, 1901, at Florac, in the Cevennes (A. H. Jones); July 24th, 1901, above 5000ft. on the Durmitor (Nicholl); April 25th, 1902, at Vernayaz, excessively abundant, June 27th-30th, 1902, at St. Georges in the Jura (Wheeler); May 14th, 1902, at Locarno, July 9th, 1902, at Bejar (Chapman); May 25th, 1902, common at Veytaux, May 26th-June 6th, 1902, at Montreux (Barraud); June 16th-21st, 1902, above Santa Maria, near Susa (Lowe); June 26th-30th, 1902, abundant on the hillsides opposite Sauchay, Forêt d' Arques (Moore); July, 1902, at Gavarnie (Hampson); July 5th-30th, 1902, between Villars and Gryon (Moss); July 15th, 1902, at St. Martin-Vésubie (Powell); July 28th-31st, 1902, at Chavoire, August 8th-10th, 1902, at Megève (Tutt); April 24th, 1903, at La Guiranne (Powell); April 24th, 1903, at Pont du Gard, July 29th-August 3rd, 1903, on the Riffelberg, at some 8000ft. (Sheldon); April 25th, 1903, at Les Avants, July 27th, 1903, on the Simplon (Wheeler); May 1st, 1903, at Geneva (Muschamp); very common May 25th-June 10th, 1903, at Theux (Derenne); June 25th, 1903, on Mt. Pilatus, June 27th, 1903, in the Surenen Thal (Keynes); July, 1903, on the Sépey Road (Lemann); July 2nd, 1903, at St. Martin-Vésubie (Rowland-Brown); July 13th, 1903, in the Laquinthal (Wheeler); July 13th, 1903, at Esteng, at 1750m. (Powell); July 13th-24th, 1903, in Corsica (Rowland-Brown); July 26th, August 3rd, 1903, in the Laquinthal (Reverdin); July 28th, 1903, between Useigne and Arolla, July 29th, 1903, from Haudères to Satarme, August 1st-11th, 1903, at Arolla (Tutt); May and June, 1904, at Florennes (Derenne); May 11th, 1904, at the Pont du Gard (Chapman); May 12th, 1904, at Chambésy, May 29th, 1904, on the Grand Salève (Reverdin); May 14th, 1904, at the Castle of Dorneck, at Dornach (Leonhardt); June 19th, 23rd, 1904, at Macolin (Lowe); July, 1904, at Innsbruck (Lemann); July 12th, 1904, on the Brenner (Rowland-Brown); July 26th, 1904, at the top of the Col de la Faucille, near Gex, August 9th, 1904, between Saas-Grund and Hüteck, August 12th, 1904, between Balen and Stalden (Tutt); July 27th, 1904, at Rudersdorf (Dadd); May 2nd-3rd, 1905, at Digne (Sheldon); May 3rd, 1905, at Geneva, July 1st, 1905, on the Simplon, July 10th, 1905, at Campolungo, July 25th, 1905, on the Dent du Midi (Muschamp); June 9th, 1905, on the Salève, July 4th, 1905, at Frenières-sur-Bex, July 10th, 1905, at Binn, July 14th, 1905, in Val Rosa (Blachier); May 9th, 1905, at Remoulins, August 9th, 1905, at Courmayeur, August 12th, 1905, in the Val Véni, August 14th,1905, between Val Tournanche and Breuil (Tutt); May 11th, 1905, at Chambésy, June 3rd, 1905, on the Grand Salève (Reverdin); May 28th, 1905, at Ste. Baume, July 4th-27th, 1905, at Cauterets (Oberthür); June 26th, 1905, at Oberstdorf, June 27th, 1905, in the Oythal, July 2nd, 1905, on the Sölleneck, July 16th, 1905, at Rudersdorf (Dadd); June 29th-July 13th, 1905, at Kleine Scheidegg (Moss); about June 29th, 1905, near Aigle (Gurney); July 22nd, 1905, at Grossmain, near Salzburg (Bentall); May 10th-26th, 1906, in the Bois des Frères, May 13th, 1906, at Hermance, July 15th-30th, 1906, at Arolla (Reverdin); May 20th, 1906, at Geneva (Muschamp); May 23rd, 1906, at Podused (Grund); May 26th-29th, 1906, in the Valley of St. Pons (Powell); at the end of May, 1906, near Lahr (Keynes); June 7th, 1906, on Mont Pacagnalia, near Nice, June 28th, 1906, on the Pic de Béguines, at 1154m., July 16th, 1906, at Garamagne, on Mont Gourdon, at 1200m., July 27th-August 1st, 1906, on Mont Pélat, 2300m. (Powell); July, 1906, at Le Lautaret (Oberthür); July 7th-26th 1906, near Arosa (Jones); May 9th, 1907, at the Pont du Gard (Rowland-Brown); May 10th, 1907, at Geneva, May 28th, 1907, at Versoix (Muschamp); May 14th, 1907, at Digne (Rowland-Brown); May 16th, 1907, at Chambésy, July 10th, 1907, in the Laquinthal, July 12th, 1907, on the Alpien-Alp, July 17th, 1907, at Versoix (Reverdin); May 17th, 1907, in the Lavey Woods, May 19th, 1907, at Bex, May 20th, 1907, at Territet, May 21st, 1907, between St. Triphon and Bex (Tetley); May, 1907, in the Isle of Capri, May, 1907, at Castellamare d'Italia, June, 1907, by Lake Como (Oberthür); June 17th, 1907, at Vernet-les-Bains (Keynes); July 5th-7th, 1907, at Martigny, July 8th, 1907, at the Ganter, Simplon; July 10th-11th, 1907, in the Laquinthal, July 12th, 1907, at Alpien, July 13th, 1907, on the Rossboden-Alp, July 15th, 1907, at Savièze (Rehfous); July 13th, 1907, at Esteng (Powell); July 16th, 1907, at Bérisal (Rowland-Brown); July 9th-30th, 1907, at Gavarnie, August 1st-8th, 1907, at Cauterets (Chapman); July 30th, 1907, just before reaching Andermatt from Göschenen, July 31st, 1907, in the Göschenen Thal, August 8th, 1907, at Piora, August 14th, 1907, in the Val Roseg, August 18th and 19th, 1907, at Preda (Tutt); June 12th-14th, 1908, between Bérisal and the top of the Simplon Pass (Tetley); [June 21st-July 16th, 1908, at La Granja, very small (Lowe);] July 4th-6th, 1908, on the Rochers de Naye, July 7th-17th, 1908, at Vissoye, July 20th-31st, 1908, at Saas Fée, August 2nd-7th, 1908, at Binn, August 9th-16th, 1908, at Zermatt (Chapman); July 14th, 1908, at Charmes, Vosges (Gibbs); July 30th, 1908, on the moraine of the Glacier du Trient (Page); August 4th, 1908, at Glärnisch (Muschamp); August 5th, 1908, above Allos (Rowland-Brown); August 10th, 1908, between Lavin and Guarda (Tutt).

Habits.—The species, when newly-emerged, and resting in the early morning or late afternoon sun, on the tall grass culms that fringe the bays that here and there open into the woods that top the Kentish chalk-hills, or edge the deep chalk hollows and pits, might be considered a sluggish insect, and here, in early June, they may sometimes be seen in great numbers, walking in a stately fashion up and down the culms, folding back their wings to catch the sun, or fluttering gnat-like low down among the grass as they change position *en masse*, but settling again almost in the same spot. Here, too, at sunset, they may often be observed in numbers at rest on the grass stems, where they have taken up their resting-quarters for the night. But, after the species has been on the wing for some time, and they have ceased to congregate in this manner, their movements become much more active, and, when flying rapidly, their small size and dark colour make them somewhat difficult to follow, *e.g.*, in the Val Roseg, on August 14th, 1907, some imagines were noticed on the marshy spots near the entrance of the valley, and one, observed flying by the side of a narrow ditch, presented a very dark appearance, looking much larger than it really was. All the while it continued flying in a line it was not difficult to follow its rather twinkling wing-movement, but, doubling back quickly, it was immediately lost to sight, although a minute or so afterwards it reappeared again, following the same course as before. Two examples paired were observed resting on a grass-culm on one of the flowery banks in the same valley; being disturbed, the ♂, in poor and wasted condition, immediately took to flight, carrying the ♀ which had evidently only just recently emerged. Placed in a box, however, they very soon separated. Another pair was taken *in cop.*, on the Albula Pass, on the afternoon of August 19th, 1907; they were then resting on a grass culm, the ♂ above the ♀; when disturbed, the ♂ alone took to flight, the ♀ hanging suspended, thus following what is apparently the habit common to all the "blues," if disturbed when paired; in this case, also, the ♂ was in poor condition, and its wings frayed, the ♀ perfect; they remained paired until after 9 p.m. (but were separated next morning), and the ♂ died a few hours afterwards. Here, above Preda, on the afternoon of August 18th, 1907, the species was observed flying somewhat freely by the roadside near the Weissenstein Inn, among its foodplant, the specimens sunning themselves on leaves and flowers, turning their backs to the sun, and opening their wings, but resting sometimes head downward, at others with the head upwards, in fact at any angle, so long as the sun shone on the partly-expanded wings; the latter seem to be kept continually on the move. The butterflies appeared to prefer to rest on the leaves of coltsfoot, the yellow flowers of *Anthyllis*, or on those of a small *Campanula*; sometimes one chose the ground on which to sun itself. The flight of the species, as already noted, is sometimes rapid, considering its small size, and its colour makes it difficult to follow. An especially large ♂ was observed flying rapidly across the road on the Albula, on August 19th; so large was it, and so grey its appearance, that, for the moment, it was supposed to be *Coenonympha satyrion*, but closer examination proved it to be a ♂ of this species, in excellent condition. Others were observed on flowers of *Anthyllis*, and one on the capitulum of a daisy. The species stands at rest with its wings thrown well up, its front wings forward, the spots on the underside of the forewings in a direct line with those of the hindwings, the antennæ, as is usual with the "blues," thrown well forward, and separated at rather less than a right angle. When, however, asleep, *C. minimus* pulls its forewings back within the hindwings, like the other "blues," showing only two of the spots on the forewings, those being now nearly in a line with the outer margin of the hindwings. Smallman observes (*in litt.*) that, on June 8th, 1907, he observed the insect sunning itself on various species of grass, having its head down, and wings open, so as to make an angle of about 45° with each other, the hindwings being kept far back, and the front margins in line with the head; the antennæ, he says, were kept on the same level as the body, and at an angle of about 35° with each other; the insects seem to settle so that the sun shines directly on their wings, and, when sunning themselves, they keep almost quite still, but if disturbed they fly a good way off; when flying, they are not very easy to follow owing to their small size, dull colour, and fairly rapid flight. A pair taken *in cop.* at 5.30 p.m., remained so until 10 p.m., but separated before 8 o'clock next morning, and one wonders whether, in nature, they remain paired all night. Donovan also speaks of its quick flight, and the ease with which it is lost to sight when actively on the wing. In its resting-habits it is very gregarious; sometimes many dozens may be seen in the space of a square yard, usually resting head downwards on grass and other low plants in a sheltered spot at sundown. Helps remarks that the imagines, at Horsley, were observed to sleep on the undersides of the leaves of small shrubs on the sheep leas, 50 or more being observed on a little seedling-beech, about 3ft. in height, the afternoon being dull and lowering, and nothing on the wing; whilst Prideaux observes that, in dull weather, he has observed them resting on tall grasses, but falling down out of sight when disturbed; he further notes that it is, in his experience, unusual for them to associate with the other Lycænids in their gregarious habits towards sundown. On the Cotteswolds, Watkins says that the resting-habit for the night is chiefly with the head downwards, the antennæ apart and extended in front of the head, resting on the culms of the grasses; of a large number observed a few were resting horizontally, or with head upwards, in almost every instance on blades and not on stems of grass, the antennæ, however, always extended in front; he adds that *Polyommatus icarus* rests at sunset in a similar manner in the same place, but there were at least a dozen *C. minimus* to one *P. icarus*. Rehfous observes that he has noticed the insect in the Geneva district flying among grass from 8-9 a.m. to 6 p.m., and on the move even if the sky be slightly clouded; it rests on grass near the ground, the wings generally closed, but sometimes thrown open. Zeller notes that at Tuors Pensch it rested in company, especially on a tall herbaceous papilionaceous plant, with pale yellow blossoms. Like so many of its congeners, the ♂ s of *C. minimus* are very fond of drinking at runnels of water, or a puddle in the paths in the alpine valleys, in the hot sun, holding their own with *Plebeius argyrognomon* (*argus*), *Agriades coridon*, and the larger Erebias and Argynnids that collect at such spots. Near Piora, on August 8th, 1907, we saw freshly-emerged examples quite at home among such crowds of thirsty butterflies as we had rarely seen before, refusing to be hustled by *Agriades coridon*, or driven from their chosen position by *Erebia mnestra* or *Argynnis niobe*. Keynes observed it most abundantly in the Surenen-Thal, on June 27th, 1903, sometimes nearly a hundred on a square foot of damp earth, whilst, in their habits, the insects seemed rather like flies than butterflies, for, if disturbed, they hovered round, without flying away. Zeller tells how, on June 9th, he found over 100 on a spot of wet ground, with *Hesperia alveolus*, *H. andromedae*, *Nisoniades tages*, and *Pieris napi*. Rowland-Brown saw it in swarms with *Polyommatus escheri*, *P. icarus*, *Cupido sebrus*, *Cyaniris semiargus*, *Agriades bellargus*, etc., on the little islets of rich black mud where the historic little stream runs into the Eaux-Chaudes, above "the Baths," at Digne, whilst Jones observed it, in July 1906, in hundreds together, on the muddy roads near Arosa, and Jordan, near Zermatt, found it exceedingly abundant on a small wet piece of moss by the roadside, on a hot day; 50 were counted, and there were possibly double that number within two or three square inches. Powell notes it also as fairly common on damp patches on the pathways with *Cupido sebrus*, at Esteng, in the Alpes-Maritimes. Wheeler says that it abounds with other blues in the neighbourhood of Bérisal, with which it congregates in great numbers on the moist places in the road, whilst in the Val Tinière behind Villeneuve, as at St. Georges in the Jura, he has seen large manure-heaps almost covered by many hundreds of this species. Blachier observes that, in the Geneva district, he has seen it collected on the road and footpaths at damp spots, generally in company with *Cupido sebrus*, *Nomiades cyllarus*, *Hesperia malvae*, *Powellia sao*, and *Nisoniades tages*. Dickore records it as fond of coming to wet places in Hesse; Kranz also says that, like other blues, the species loves the moist places found in the roadways in Bavaria, whilst Schneider observes the same habit in the species in Bohemia, and Richter in Salzburg. It has exactly similar habits in Britain, for on Whit-Monday, 1892, at Dursley, *C. minimus* was in swarms sitting in rows of a dozen or so on the damp mud in the roads, left by the rain the previous day (Griffiths); whilst in June, 1906, on the very summit of one of the Cotteswold hills, it was swarming on June 17th, and appeared to be very partial to the rapidly-drying rough upland path on which they were sunning, whilst one example was so devoted to a heap of horse-droppings, that it allowed itself to be picked up with the fingers (C. J. Watkins). Griffiths also notes that he once saw this species resting on sheep's droppings, in the neighbourhood of Portsmouth, whilst Galvagni says that he noticed specimens resting on animal excrement in the Langes-Thal, in the Brenner district. It is somewhat uncertain in its appearance, sometimes occurring in great numbers, at others being very scarce, and this is so, not only in Britain, but on the continent, *e.g.*, it is reported to occur in May, in some years, in thousands on the Schönberg, near Freiburg, in Baden (Reutti); whilst it abounds in some years at Krefeld, in others being quite rare (Rothke); and also in parts of Saxony (Steinert). Its peculiarly local habits are very noticeable; it will appear either in the same, or some very near, place, year after year, congregating there to the exclusion of other places in the neighbourhood; thus it is at Cuxton, the South Foreland cliffs, etc., whilst Carr says that it abounds around Kingsdown and Martin Mill, in sheltered places, five or six examples often being seen in company flying over low bramble bushes, and in most perfect condition. We have already noted that it is sometimes enticed to flowers, but this is not its usual habit. Steinert says, however, that it is much attracted in its mountain localities in Saxony, by the blossoms of *Armeria*, and Sparre-Schneider notes finding two ♀s on *Aquilegia* near Bergen.

Habitats.—One lovely morning in the first week of June, 1873, after walking for some distance through the woods behind Cuxton Church, a dive to the left down one of the narrow woodland paths, brought us out upon the high chalk downs above the village of Halling, and overlooking the Medway. Here, in one of those little inlets that lead into the wood, the grass grew tall among the bushes, whilst the ground was carpeted with *Anthyllis* just coming into bloom, and on the grass and bushes, busily flitting in the hot sun, or resting on a bare patch of chalk, were hundreds of freshly-emerged *Cupido minimus*; but, in the British Islands, this widely distributed species affects a great variety of habitats. In the southern and south-eastern counties, although by no means confined thereto, it frequents particularly the chalk-hills, whilst, in the western counties, as well as the midlands, and in the north, it equally affects the limestone hills and mountains; on the coasts of Scotland, Ireland, and elsewhere, it is equally abundant on the sand-hills, and, indeed, in a variety of other chosen habitats, *e.g.*, the sandy flats of Glen Lochay, the sandy coasts of Galway, the limestone rocks of Clare, and the coast rocks and slopes of Kincardine. Abroad, it has a most amazing range of habitats from the grassy glades of hot Provence, and the gullies of Andalusia, to the summit of the Simplon, Gemmi, and Albula passes, the high pastures above Zermatt, Arolla, Piora, Le Lautaret, and Abriès, and here it sometimes abounds at 7000ft.-8000ft. elevation, whilst it is also found on the pasture slopes of Saltdalen and Bödo, in Lapland, in the Altai at 6000ft., as well as among the mountains of Thibet and Mongolia, and Leech says that, at How-kow and Ta-chien-lu, it was found up to an elevation of 10000ft. As already noted, its chief haunts in the south of England are on the cretaceous formation, *e.g.*, the whole line of the North Downs through Surrey and Kent, to Ashford and Dover, the sheltered hollows at the foot of the chalk slopes at Folkestone, at Cuxton, and in the Chatham district; the chalk-downs of Surrey, the chalk-pits at Worlington, Dorking, Guildford, as well as the sheltered hollows of the Ranmore slope; also the South Downs, *e.g.*, the chalk-downs of Sussex, abundant from Brighton to Clayton, near Lewes, etc.; very plentiful locally on the Berkshire downs, as well as through those of Hampshire and the Isle of Wight; it is abundant also on the Wiltshire downs, in sheltered nooks in the Salisbury district, and along the foot of the downs at Devizes; on the chalk-hills of Bucks, between Kimble and Great Missenden, with *Adscita statices*, *Nemeophila plantaginis*, etc. (Rowland-Brown). It also occurs on the hills and railway banks about Bedford and Luton (Barrett); in the sheltered nooks and chalk-pits of the Gogmagog hills, near Cambridge (Lee); and abounds in Norfolk on the chalk bordering the Breck Sands (Atmore). It is abundant all over the mountain-limestone of the Cleveland district of Somerset, and on the Cotteswolds, where there is a varied vernal carpet of wild flowers, including the kidney-vetch, in June (C. J. Watkins); it is also noted as common in a stone quarry on Stinchcombe Hill, in the Cotteswolds (Spiller). In Lancashire it is confined to the limestone districts (Sharp), and is reported locally from railway-banks in Cumberland, at St. Bees and Wreay, whilst it is said to be common on the railway-banks at Tenby

(Fox), and in the woods of the Llandudno district (Harding), but at Stockton, about eight miles from Rugby, it is again reported as being found in a chalk-pit where *Anthyllis* grows in abundance (Garrett). It abounds at the end of June, at Black Head, in county Clare, on the horizontal limestone slabs, sometimes at the very edge of the cliff, where nothing much grows, except its foodplant and a few stunted tussocks of grass, the rare *Adiantum capillisveneris*, *Saxifraga hypnoides*, *S. tridactylites*, and the lovely fragile *Geranium sanguineum* (Lawless); near Galway it occurs on the railway-banks (Walker), but also on the coast sandhills of Sligo (Russ), and is said to be especially abundant on the Portmarnock sandhills (Birchall), whilst it also occurs freely on the coast hills near Belfast (Barrett). It occurs freely on St. Cyrus' cliffs, north of Montrose, and is generally common (Duncan); but on the banks of the Lochay, in Perthshire, is found most abundantly on a small sandy flat (Morton). With regard to its excessive localisation, Barrett observes that it loves warm hollows and sheltered spots, such as old chalk-pits, limestone quarries, etc., occurring year after year, commonly, in exactly the same spot of a few square yards in extent, though, perhaps, hardly to be found elsewhere for miles around; on the warm slopes of the chalk-hills of the southern counties, however, it is very generally distributed, though even here it will resort to any slight ditch or hollow full of flowers, to the exclusion of the surrounding more open ground. Its habitats on the continent are exceedingly variable. It is found almost throughout Belgium, but more especially in the limestone regions, preferring elevated meadows, or the dry and arid slopes of embankments of railways, etc. (Lambillion). It occurs in the northern part of France in localities quite similar to those in Britain, but, in the south of France, its localities are especially varied. At Remoulins, it is to be found in April, flying in the glades and open spaces among the tall bushes that clothe the slopes, near the Pont du Gard, among swarms of *Scolitantides baton*, *Aricia astrarche*, *Polyommatus icarus*, *Leptosia sinapis*, *Euchloë cardamines*, *E. euphenoides*, etc. At Grésy-sur-Aix, it loves the corners of the meadows on the edge of the bush-covered slopes, where swarms of Melitæas—*M. didyma*, *M. phoebe*, *M. parthenie*—*Brenthis dia*, *Agriades bellargus*, etc., abound; at the top of the Col de la Faucille, it haunted a meadow with *Brenthis ino*, *Erebia euryale*, *Adscita geryon*, etc., whilst at Chavoire, it was found with *Lycaena arion*, *Everes argiades*, and swarms of *Thymelicus acteon*, on the grassy banks edging a lucerne field, just overlooking the lovely Lac d'Annécy. At Megève it preferred a splendid upland meadow, swarming with most of the subalpine species of the district, which swing in abundance from the wealth of wild-flowers growing there. In the Alpes-Maritimes, Millière says that it inhabits dry woods and hillsides. At Digne, it was discovered on the edges of the steep flowery gullies that discharge their streamlets into the Eaux-Chaudes, whilst, at Abriès, it occurred at 6000ft. elevation by the wayside with *Cyaniris semiargus*, *Klugia* (*Thecla*) *spini*, *Loweia gordius*, etc., as well as on the upland pastures, far above the larch forest, on the way to the Pointe de la Lauze, among a strange mixture of lowland and subalpine species, as well as on the topmost slopes of the Crête de Reychasse. It was also very abundant on one great flowery slope leading up to a high, rounded knoll above Le Lautaret, at fully 8000ft. elevation; and, here, some of the specimens were typical, whilst others were almost as large as the *Cyaniris semiargus* of this elevated district. In the southern departments of France, Powell says that it is generally a rather scarce species, occurring, however, in such widely different localities as a dry limestone valley near La Maunière, Hyères, and the rich alpine pastures of Mont Pélat, Basses-Alpes, at the foot of the peak, at above 7000 ft.; it is also found on the pastures above Beauvézer, in the high damp marshy meadows of Esteng in the Alpes-Maritimes, on damp grassy ground, surrounded by dry limestone slopes and terraces near the col, to the north of the summit of Mt. Pacagnalia, near Nice, and on the narrow strip of pasture on the north side of the Pic de Béguines. He further observes that, even when found in dry valleys, in southern France, its immediate surroundings are almost always damp and often oozy, and that it never seems to be found on an absolutely dry hillside, or on a dry plain. It occurs on the slopes in the Island of Corfu (Norris); and near Ragusa, in April, in a well-sheltered estuary where the vegetation is almost the same as that of the Italian Riviera, where also occurred *Polyommatus icarus*, *Aricia astrarche*, *Agriades bellargus*, *Scolitantides orion*, *Nomiades cyllarus*, *Celastrina argiolus*, *Thais polyxena*, *Papilio machaon*, *P. podalirius*, *Pieris ergane*, *P. rapae*, *P. brassicae*, *Leptosia sinapis*, *Anthocaris belia*, *Polygonia egea*, *Pyrameis cardui*, *Pararge egeria*, and a host of other species; it was also found in a steep meadow on the slopes of the Drinaça, in Bosnia, at about 4000ft. elevation, where *Cyaniris semiargus*, *Hesperia alveus*, *Melitaea aurinia*, etc., were also abundant (Nicholl). Little is known of its habitats in Italy; we took it sparingly on the steep slopes at Courmayeur, almost opposite the foot of the Glacier de Brenva, also by the roadside in the Val Tournanche, almost to Breuil, and in a hot rocky little gorge, the slopes of which are covered with small chestnut trees and large bushes of *Colutea arborescens*, at the back of Susa, where it flew among *Everes argiades*, *Polyommatus hylas*, *Agriades meleager*, *Erebia aethiops*, and many other species, and Browne says that it is fairly common in early spring, among broom, in the Isle of Capri. In Switzerland its habitats are exceedingly diverse; it swarms in the meadows at the level of the river in the Valais, abounding with *Cupido sebrus* and other species, near Branson, in the meadows at Bex, on the banks of a little stream between St. Triphon and Bex, flying with *Cupido sebrus*, *Cyaniris semiargus*, *Polyommatus icarus*, and *Nomiades cyllarus* (Tetley), and on the lower slopes at Vernayaz, and the borders of the Lavey woods, whilst it is equally abundant on the Rochers de Naye, almost on the edge of the snow, above 4000ft. in May (Barraud), and on a marshy waste by the side of the road between Useigne and Evolène, where it flitted merrily with *Plebeius argus* (*aegon*), etc., over the boulders (Rowland-Brown); on Mont Pilatus, it occurs on the slopes among *Cupido sebrus*, *Loweia dorilis*, *Colias hyale*, etc. (Keynes), whilst we have taken it in a great variety of alpine habitats, *e.g.*, it was common in the Saas-Thal, between Stalden and Saas-Grund, on the grassy slopes by the roadside; on the upland flower-clad slopes of the Simplon, and the edges of the woods in the Laquinthal; at Ferpècle, in the alpine meadows at the foot of the Glacier de la Dent Blanche; on the steep flower-covered slopes between Haudères and Satarme, whilst at Arolla it is to be found in the grassy hollows on the edge of the pinewood, as well as on the higher slopes where it flies with *Melitaea aurinia* var. *merope*, *Colias palaeno*, *Erebia gorge*, *E. lappona*, *E. glacialis*, *Œneis aëllo*, *Pontia callidice*, etc., at an elevation little short of 8000ft. It haunts the flower-clad banks between Göschenen and Andermatt, the topmost pastures of the Col du Torrent, the moraine of the Glacier du Trient, and the pasture-slopes above Piora and the lovely Lake Ritom, with *Polyommatus eros*, *P. coridon*, *Erebia mnestra*, *E. euryale*, etc., as well as the hot sun-baked banks at Piotta, among swarms of *Melitaea athalia*, *Brenthis dia*, *B. amathusia*, *Lycaena arion*, *Dryas paphia*, etc., and Rosa notes it as quite abundant near the summit of the Gemmi Pass, at 7600ft. elevation. In the Tyrolean alps we found it on the slopes of the Penegal, high above Mendel Pass; it is especially abundant in the Langes-Thal, in the Brenner district, and Jones also took it in the alpine meadows, above the village of Brenner; whilst, in the Engadine, the summit of the Maloja Pass, the flowery nooks by the roadside high up on the Albula Pass (where, at the summit of the Pass, among the bare boulders, surrounded by unmelted snow in mid-July, 1878, it was flying fresh and lively, in numbers), and the flowery slopes, as well as the marshy spots in the lower part of the Roseg Valley, have all produced this species. In the most southern German alps, in a mountain meadow on the Sölleneck, it occurred with *Erebia melampus*, *Colias phicomone*, *C. hyale*, *Aporia crataegi*, *Coenonympha iphis*, *C. satyrion*, *Lycaena arion*, *Cyaniris semiargus*, *Polyommatus icarus*, etc., whilst it was also noticed on a sunny bank at the junction of the Oy and Trittach, two thoroughly mountain torrents, which was alive with butterflies; lower, it was common by the banks of the river, as also on a spot where the river had formed an extensive sand-bank, overgrown with willow and other bushes, where it flew with *Lycaena arion*, *Cyaniris semiargus*, *Agriades bellargus*, *P. icarus*, *Plebeius aegon*, and *P. argyrognomon* (Dadd). In the Baltic Provinces the species appears to be distributed locally in grassy wastes, covered with bushes and flowers, but is quite absent in many apparently suitable places (Nolcken); whilst in Scandinavia it is reported to inhabit meadows, etc. (Zetterstedt). In the north of Germany it is exceedingly local, but in the south and central parts it is abundant, haunting woodland meadows, bush-covered mountain slopes, apparently preferring dry ground, and reaching up to the alpine region (Speyer); in Pomerania, it is somewhat rare among the pines that grow by the shore at Misdroy, and also in the royal forest near Wildenbruch (Hering); whilst in Mecklenburg also, it affects the sandy districts of the Sandhäger firs (Stange), similarly at Oldenburg in Holsatia (Saxesen), as well as at Oldenburg in Hanover (Rehberg), it haunts sandhills. In the Rhine Provinces, it is locally common in mountain-meadows, as it also is in the Hartz (Heinemann). In Hesse, it varies in its choice, around Wiesbaden occurring only on the limestone formations (Rössler), abundant on the grassy slopes of a hillside meadow near Wiesbaden (Prideaux); at Hanau it is found in moorland meadows, and forest clearings (Limpert and Röttelberg), and in the Hinterland it also prefers forest clearings and wood-meadows (Glaser); near Frankfort-on-Main it is found in meadows, as well as on the slopes of the Taunus and neighbouring mountains (Koch). In Waldeck, it is found on the slate mountains near Wildungen, but on the sandstone at Arolsen, and the muschelkalk limestone at Rhoden (Speyer). In Thuringia it is common on all the limestone ranges, as well as on sunny slopes and woodland meadows (Krieghoft), and is common in the Steiger and Willroda Forests, and on the dry mountain-meadows above Zeitz (Wilde). In Brandenburg it is said to occur chiefly on the limestone ranges (Bartel and Herz); it is certainly common on the limestone downs near Rüdersdorf (Dadd); in Silesia it haunts dry woodland meadows in the Trebnitz mountains, and in the southern part of Upper Lusatia on basalt and phonolith. In the Kingdom of Saxony, also, it is very local, occurring chiefly in flowery mountain-meadows (Steinert); whilst in Bavaria, in dry meadows, it is often abundant (Freyer). In Baden and Alsace it is generally common on the foothills of the mountains, sometimes very abundant (Reutti), and is locally abundant on small limestone hills at the edges of the plain near Lahr (Keynes). In Posen it is said to haunt moist woodland meadows, and the sides of ditches by the main roads (Schultz). It occurs chiefly in woodland meadows in Bohemia (Hüttner), and in the meadows and wayside places in Moravia (Schneider), but chiefly on the lower limestone mountains, although it also occurs in woodland meadows in Salzburg (Richter). In Italy Stefanelli says that it frequents bushy places in the plains, hills, and mountains. We have already remarked on its special haunts at Susa and Courmayeur.

BRITISH LOCALITIES.—In England, almost throughout, although still unrecorded for some counties, *e.g.*, Middlesex, Leicester, Rutland, Nottingham. In Scotland, local as far north as the Caledonian Canal and Moray Firth. In Ireland, somewhat local, rare generally inland, but widely dispersed throughout the island (Kane). ABERDEEN: not rare inland, common on coast (Reid), Aberdeen district (Traill). ANTRIM: near Belfast very common (Birchall), between Carrickfergus and Whitehead, abundant (Bristow). ARGYLL: near Oban (*E.W.I.*, vi., p. 182). AYR: Ardrossan (Colquhoun), Monkton, Troon (Duncan), Girvan (Old). BANFF (Brown). BEDFORD: Barton Hills, locally common (Gifford-Nash), Bedford, Luton (Barrett). BERKS: locally plentiful—the Berkshire Downs, Streatley Hill, Reading district (Hamm), Maidenhead district (Lang), Newbury (Hopson). BUCKS: Halton (Stainton), between Princes Risborough and Kimble, Wendover (Rowland-Brown). BUTE: Whiting Bay (Stewart), Kilmory (*teste* Dalglish), Arran (Somerville). CAMBRIDGE: Flem Dyke, Fulbourn near Cambridge (Farren), Cambridge, Gogmagog Hills (Lee), Devil's Dyke (Peed). CARNARVON: Llandudno (Harding), Llanferris (Gregson), Gloddaeth (Gardner). CHESHIRE: rare—Neston (Gregson). CLARE: coast districts, Black Head, etc. (Lawless), Ennis (Brakey). CORK: Coolmaine Castle, Harbour View, Courtmacsherry (Donovan), Skibbereen (Wolfe). CORNWALL: exceedingly scarce—Land's End (J. E. Gardner), Saltash (Clark). [Two other records are said to have been ♀ *aegon*, V.C.H.] CUMBERLAND: locally abundant—Cowran Hills (Armstrong), Carlisle (Thwaytes), Wreay, Gelt, How Mill, St. Bees (F. H. Day), Hayton Moss (Routledge), Whitehaven near St. Bees (Murray), Newbiggin Woods (Wilkinson). DENBIGH: Clwyd Hills, near Ruthin (Gardner), Llandulas (Pitcairn-Campbell), Colwyn Bay district (Newstead). DERBY: central part of county common—Dovedale (Harris), Middleton Dale (Alderson). DEVON: Torquay (Darwin), Plymouth district, rare, Meavy Vale, Dartmouth, Slapton, Teignmouth, Seaton (Reading). DONEGAL: Killybeg (Walker). DORSET: locally common—Isle of Portland, Isle of Purbeck, Blandford, Swanage coast (Bankes), Culliford Tree, Sutton Poyntz, Chalbury Vale (Bogue), near Weymouth, on the cliffs towards Lulworth (Mathew), Dorchester, Weymouth (Bingham), Sherborne (Douglas), Swanage, Hod Hill (Fowler), between Swanage and Durlston Head (Griffiths), Cranbourne (Nelson). DUBLIN: Sutton, Malahide, between Blanchardstown and Clonsilla (Sinclair), Portmarnock sandhills (Birchall). DUMBARTON: local—near Dumbarton (Gray). DUMFRIES: Dumfries, common (Lennon). DURHAM: local—near South Shields (Harrison), Marsden, Witton-le-Wear, Castle-Eden-Dene, Wylam (Wailes), Shull (Backhouse), Ragpeth near Flass (Ornsby), Black Hall

Rocks (Robson), Sunderland coast (Corder), Darlington, abundant (Backhouse). Elgin : Forres (White), Banks of the Lossie, Birnie, Knock of Alves (Gordon). Essex : near Walden (Joseph Clarke), Epping district (Machin and J. A. Clark). Fermanagh : Enniskillen (Sinclair). Fife : on the sea slopes (Evans), Seafield between Kirkcaldy and Kinghorn (Syme). Flint : Bagillt, the Loggerheads, Talargoch (Walker's List), Prestatyn (Arkle). Forfar : Kirriemuir (F. B. White), St. Cyrus near Montrose (Duncan). Galway : Galway, very common, Claring (Birchall), Merlin Park (J. J. Walker), St. Clerans (Lawless), Moycullen, Ardrahan (Miss Nugent). Glamorgan : Cardiff district, locally abundant (Drane). Gloucester : local, but common where it occurs — Durdham Down (Hudd), Worcombe, Wotton-under-Edge, Rodborough Common, Dursley (Griffiths), Stinchcombe Hill (Spiller), Cirencester (Harman), Bristol (Prideaux), Painswick (Marsden), Cotteswolds, Stroud (Watkins), Woodchester near Stroud (Mackey), Lower Guiting (Greene), Birdlip, Leckhampton (Merrin), Cheltenham (Bree), Bourton-on-the-Hill, common (Wheeler). Hants : Bournemouth, Christchurch (Thorne), Portsdown Hill (Pearce), near Andover (Stephens), Watergate (Christy), Winchester district, New Barge, etc. (Hewett), Basingstoke (Hamm), New Forest (Capper), Isle of Wight—Totland Bay (Sauzé), Niton (Cruttwell), Carisbrooke (Prideaux), Freshwater (Wright). Hereford : Hereford (Chapman). Herts : near Tring, abundant locally (Rothschild), Knebworth (Griffith), Letchworth near Hitchin (Knapp), Hitchin district (Durrant), near Hertford (Stephens), the Canal bank, Tring (Rothschild), Aldbury Owers (Lequesne), Royston (Kingston), Aldbury Down (Barraud). Hunts (Norris). Kent : locally abundant—Cuxton, Halling, South Foreland, Kingsdown, Dover (Tutt), Folkestone (Salwey), near Deal (Harding), the Warren, Folkestone (Battley), near Sevenoaks (Farren), Shoreham (Bower), Eynsford, Farningham district (Barraud), Westwell (J. E. Gardner), Longfield near Gravesend (Jennings), Ramsgate district (Willson), St. Margaret's Bay, common (Mathew), Martin Mill (Carr), Ashford (Wood), Chatham (Tyrer), Maidstone, Lower Fant (Golding), Green Street Green, Farnborough (Alderson), Darland Hill, Wigmore Wood, Great Cowbeck Wood near Holly Hill (Chaney), Luddesdown Hills (Andrews), Seal Chart (Carrington), Shorncliffe (Cardew), Birch and Darenth Woods (Stephens), Coombe Wood (Curtis). Kerry : Garinish Island (Lawless). Kincardine : coast districts (Mundie), inland, not rare, on coast, common (Reid), Ram Heugh near Stonehaven (Thomson). Lancashire : very local—Preston district (Hodgkinson), Birkdale (*teste* Sharp), Thorp (*teste* Ellis), Grange (Murray), Manchester district (Edleston), Silverdale (Chappell), between Rainhill and Dutton (Gregson). Limerick : Kilpeaton Bog (Neale). Lincoln : rare—north Glentham (Lees), Binbrook (Stedman). Nairn : Cawdor (Gordon). Norfolk : South Creek (Stephens), Cromer (Barrett), King's Lynn district, on the chalk bordering the Breck Sands, Swaffham, abundant (Atmore). Northampton : Northampton (Goss). [Northumberland : Twizell, once (Twizell list introduction) near Newcastle (Wailes *teste* Humphreys and Westwood).] Oxford : Chinnor (Spiller), Charlbury (Saunders), Enstone (Cruttwell), between Woodstock and Enstone (Bree). Pembroke : Castle Martin district, not common (Puckridge), Tenby (Fox). Perthshire : locally common—Forth, Earn, Gowrie, and Perth districts, Muirhall (White), Braes of Gowrie near Killspindie, very common (Stuart), Glen Lochay (Morton), Broxy near Perth, abundant (Buchanan-White). Roxburgh : locally common (Renton). Shropshire : Church Stretton (Phillips), Wenlock Edge (Newnham). Sligo : Sligo (Russ), Markree (Kane). Somerset : widely distributed, but local—Brockley, Bath, Clevedon, Crowcombe, Portishead, Sidcot, Taunton, Wells, Weston, Workey (Hudd), Weston-super-Mare (Head), Aller Hill near Langport (Doidge). Staffs : Dovedale (Freer). Stirling : Bridge of Allan (Wingate). Suffolk : very rare except in the extreme west—Brandon Warren (Stephens), Tuddenham (Warren), Mildenhall, Worlington (Norgate), near Newmarket (Bloomfield), between Needham and Ipswich, once (Lingwood). Surrey : common—Guildford (Thomas), Horsley (Helps), near Croydon (Rogers), Box Hill, Caterham (Bower), Oxted, Purley (Sheldon), Bagshot (Floersheim), Ripley (Simes), Dorking (Battley), Ranmore (Oldaker), Reigate (Prideaux), Hilly Field (Trimen), Sanderstead Downs (Douglas), Hog's Back (Champion). Sussex : locally abundant—Brighton to Clayton, Mouth of Patcham Tunnel (Goss), East Sussex downs—near Brighton, Lewes, Polegate, Tilgate Forest (Jenner), Worthing Downs (Fletcher), Steyning (White), Balcombe district (Hamlin), Hollingbury Hill, Lewes (Jones), Beachy Head (Blenkarn), Eastbourne ((Sotheby), Hastings, St. Leonards (Bloomfield), the downs near Eastbourne (Smallman), the downs between Steyning and Amberley (Bird), Abbott's Wood

(Dale), Holywell (Hawes). Tyrone: common on the coast from Blackhead to Larne Lough (Greer). Warwick: Stockton (Garrett), Wolford (Wheeler). Westmorland: Witherslack, locally abundant (Murray), Kendal district (Moss). Wicklow: Bray (Featherstonhaugh), Newcastle, Kilcool (Kane). Wilts: Burghclere (Alderson), Salisbury district (Carr), Amesbury (Rogers), Marlborough (Maddock), Calne, locally common (Eddrup), Devizes (Sladen). Worcester: near Powick, the Slads, Broadway, Croft Farm, the Wyche, Oddingley (Fletcher), near Worcester (Edmunds), Trench Woods (Edwards). Yorks: Boston Spa, Bramham, common (Smith), Scarborough, very common (Wilkinson), Sheffield (Doncaster), Sutton-under-Whitstone Cliff(Grassham), Wakefield (Talbot), York district (Cook), East Keswick (Walker), Wetherley, very common (Thompson).

Distribution.—The distribution of this species (omitting references to *lorquinii*) is considerable, extending from Andalusia, Sicily, and Greece in the south, to the Arctic regions in the north, being found in Scandinàvia at Saltdalen, from 66° 30′-67°N. lat., and Bödö, 67° 20′N. lat., and from the coast of Galway 10° 20′W. long., to Kamtschatka 160°E. long. Asia: Asia Minor—Taurus mountains (Bethune-Baker), Anatolia, in the mountains (Lederer); Armenia—Brussa, Tokat, Amasia (*teste* Rühl); Persia—Irak district (Young), Asterabad (*teste* Rühl); Altai mountains—Tchuja Valley (Elwes), south-western Altai (Kindermann), Tarbagatai and Ala Tau (Haberhauer), Kara Kasy (Grum-Grshimailo); Eastern Thibet—Aksu Korla (Bethune-Baker), Amdo, Koko-Nor (Grum-Grshimailo), How-Kow (Leech); Mongolia—Kentei mountains (Dorries), Urga, Changai mountains (Leder., Brit. Mus. coll.); China—Ta-tsein-Lou (Leech); Amurland—Bureja mountains (Radde), Pokrofka, rather common (Graeser), Dahuria (*teste* Rühl): Siberia—Ost Sajan (Oberthür), Kamtschatka (Alphéraky). Europe: Austria-Hungary: throughout, but more abundant in the south and centre than in the north—Bohemia—Branjk, foot of St. Laurentiusberg, Prague (Nickerl), Carlsbad, common, Schupfenwiese, Hammer (Hüttner), Senftenberg (Fritsch); Moravia—Brünn, rather common (Schneider); Upper Austria, throughout—Vienna (Bethune-Baker), Steyer, Wels, not common (Brittinger), Linz, etc., (Fritsch); Lower Austria—Kahlengebirg and district, (Rossi), Gresten (Schleicher), Mödling (Lang), Hernstein, common (Rogenhofer); Salzburg, from the plains to the high alps, most abundant in the lower mountains—the Gersberg and Glan meadows (Richter), Grossmain (Bentall), Salzburg (Fritsch); Tyrol—Glockner district, Botzen, Trient (Mann), Allgau Alps, up to 3800ft. (Speyer), Bregenz (Fritsch), Stubai, Tratzberg, up to 4300ft. (Hinterwaldner), the Dolomite district (Mann), Innsbruck to 6600ft., common, Mendel Pass (Tutt), Péjo, Campiglio (Lemann), the Brenner—Langes-Thal, common (Galvagni), Taufers Valley, common (Weiler), Schindlerspitz, Muttekopf, Höttinger-Alp, Lafatsch mountains, Kühtai, Patscherkofel, Pfitscher mountains, Amthorspitz, Rieserferner, Misurina Lake, Schlern, Stilfser mountains (Heller), the Brenner and Stelvio Passes (Rowland-Brown), Cortina (Jones), Runglstein (Rebel); Carinthia—Friesach (*teste* Rühl), Preth, rare (Zeller); Villach, Heiligenblut, Wolfsberg (Lemann); Styria, throughout and common—Schwarzwipfel, etc. (Höfner), Ennsthal—Algen near Admont, very common, Waaggraben, Gesäuse, on the Wiesenrainen near Hohentauern, Kalblingin Krummholz (Strobl); Croatia—Agram district, Podused, common (Grund), Fiume (Aigner-Abafi), Jofesthal (*teste* Rühl); Dalmatia—Val d'Ombla, near Ragusa (Nicholl); Hungary—almost everywhere—Budapest, Peszér, Kecskenict, Nagyvárad, Pécs, Pápa, Szaár, Györ, Felsölövö, Sopron, Pozsony, Lévárd, Tavarnok, Rozsnyó, Betzterczebanya, Zólyam, Kocsócz, Bellus, Drietoma, Bresztova, Gölniczbánya, Iglo, Sz. Olantzi, Táton, Eperjes, N. Bocskó, Vorösneast, Karacsonfaloz, Louka, Rató, M. Sziget, Técsö, Bustyzháza, Kujzt, Nagyszeben, Nagyág, Mehadia, Orsova, Lipik, Plitoicz, Oqulin (Aigner-Abafi), Svabhegy, very common (Jones), Fünfkirchen, Hermannstadt, Raab, Rosenau (*teste* Rühl), Wolfsthal (Nicholson), Kikalahegy (Vángel-Jenö); Galicia—Lemberg, Krakau, Dranczy (Nowicki), Cracow district—Ozerkinow, Chelmie (Zebrawski). Belgium: almost throughout—Bouge, Fond d'Arquet (Lambillion), the Ardennes (Bath), Embourg, Carrière du Prince, Comblain-la-Tour (Donckier), Dinant, very common (Lenoir), Waulsort (Huyge), Vallée de la Molignée (Merny), Florennes, Theux (Derenne), Han-sur-Lesse (Sibille), Rochefort (Carlier). Bosnia and Hercegovina: generally common (Rebel)—Drinaca, Jablanica (Nicholl), Klekovaca, Pale, Lakat, Trebevic (Apfelbeck), Kalinovik (Schreitter), Prozor, Maklenpass, Radusa (Hilf), Nevesinje (Uhl), Stolac (Sturany). Bulgaria and Eastern Roumelia: The Rhodope mountains (Nicholl). Sofia

(Drenowski), Slivno (Nicholl), the Dobrudscha (Bachmetjew). [Channel Islands: Guernsey (Ansted). Luff states that this record was made in error, the specimen being a small *Polyomnatus icarus* (*in litt.* 28, xii., '08).] Corsica (Rowland-Brown). Denmark: Sjaelland, Fyen, Jutland (Lampa), Skove, Frederiksdal, Orholms, Faelled, Fredensborg, Hornbacks, Plantage, Goro, Naestved, Vordingbord, Odenoe, Vesterhaesinge, Jylland, Horsens, Randers, Holro, Moens Klint (Bang-Haas), Isle of Seeland, Oldenborg (*teste* Rühl). Finland: only found in the extreme south (Federley), Karelia (Aurivillius). France: generally distributed (Berce), but rare and local in the north (Dupont)—Ain—Col de la Faucille (Tutt); Allier (Frionnet); Alpes-Maritimes—Cannes (Warburg), St. Martin-Vésubie, etc., Moulinet, Sospel to Pieracore (Oberthür), up to Madone de Fenestre, 6260ft., Nice, Cascade of the Boréon (Bromilow), Esteng, Entrevaux, Garamagne, Mont Gourdon, Mt. Pacagnalia near Nice (Powell); Aube—common (Jourdheuille); Aude—on dry hills (Mabille); Basses-Alpes—Beauvézer, Colmars, Mont Pélat (Powell), Barcelonette, Allos, Digne, etc. (Rowland-Brown), Larche (Bellier), Enchastrayes (Oberthür); Basses-Pyrénées—(Frionnet); Bouches-du-Rhône—common on the hills (Siepi); Aix-en-Provence (Fountaine), Ste. Baume (Oberthür), Vallon de St. Pons (Powell), near Marseilles (Foulquier); Brittany—throughout (Griffith); Calvados—Moult, Touffreville, May-sur-Orne, Quilly (Moutiers), Val de Folie, Caen, and behind the Jardin Botanique, Mornville Wood (Fauvel); Cantal (Frionnet); Cher—Sologne, St. Florent (Sand); Dordogne—Jaures, Lembras (Tarel); Eure—Pont-de-l'Arche (Dupont), Forest of Vernon (Bellier); Eure-et-Loir—Berchères, le Mée (Guenée); Gard—Pont du Gard (Tutt); Gironde—recorded doubtfully (Robert Brown); Haute-Garonne—near Toulouse, St. Béat, Luchon (Aubusson), Lac d'Oo, Lac Vert (Caradja); Haute-Marne—Hortes, Langres, Latrecey (Frionnet); Haute-Savoie—Chamonix (Bethune-Baker), Grand Salève (Reverdin); Hautes-Alpes—Abriès, le Lautaret (Tutt), Mont Genèvre (Oberthür); Hautes-Pyrénées—generally, *e.g.*, Gavarnie (Rowland-Brown); Cauterets, etc. (Oberthür); Héas, St. Sauveur (Bath); Indre-et-Loire, Amboise (*teste* Rühl); Indre—Brenne, common (Martin), Nohant (Sand); Isère—Uriage (Oberthür); Loir-et-Cher — forest of Russy (Chevillon); Lozère—Florac (Rowland-Brown); Maine-et-Loire—near Angers (Cheux), canton of Seichs, common (Delahaye); Marne—Rheims, common on wastes and plateaux, and hills exposed to the sun (Demaison); Meurthe-et-Moselle—wood of Boudonville, Nancy (Cantener); Morbihan—rather common (Griffith); Nord—rather common in the forest of Mormal (le Roi), Mont Noir, etc. (Paux); Oise—forest of Compiègne (Boisduval); Puy-de-Dome—plateau of Randanne (Sand); Pyrénées-Orientales—generally (Rondou), to 3000ft. (Elwes), *e.g.*, le Vernet, Mont Canigou (Rowland-Brown), Vallée d'Eyna (Oberthür); Saône-et-Loire—la Senetrière (André), forest of Auxy, wood of Canada, Antully (Constant); Sarthe —very rare (Cnockaert); Savoie—Lanslebourg (Oberthür); Seine—la Varenne, St. Maur (Ragonot), environs of Paris (Goossens, in whose catalogue "*sebrus*, Hb.," appears to be misprint for *alsus*, Hb.); Seine-et-Marne—Fontainebleau (H. Brown), near Nemours (Duponchel); Seine-et-Oise—Lardy, Maisons-Laffitte (H. Brown); Seine-Inférieure—rare (Noel), hills opposite Sauchay (Moore); Somme—(Frionnet); Var—common locally on Mont Coudon, Hyères (Norris), near la Maunière, la Guiranne, Pic de Béguines (Powell), le Paradis near Costebelle (Buckmaster); Vaucluse—Brantes (coll. H. Brown); Vosges —Charmes (Gibbs); Yonne—Mailly, St. Bris, rather rare (Mabille). Germany: generally distributed in southern, and in the plains of central, Germany, but local in the northern plain and in Silesia—East and West Prussia—local and scarce, Rastenburg, Gilgenburg, once (Schmidt), the Courbière near Graudenz, once (Riesen), Rauschen (Speiser); Pomerania—Garz-on-Oder (Triepke), Wildenbruch near Misdroy, Swinemünde, Bahn (Hering); Mecklenburg, local—the Maschen near Friedland, near the Sandhäger firs, once (Stange); Holsatia—near Oldenburg (Saxesen); Hanover—near Lüneburg, rare (Machleidt and Steinvorth), Oldenburg (Rehberg), Osnabrück (Jammerath), Höxter, Hameln (Jordan), Hildesheim district, Rotzburg (Grote); Rhine Provinces, local —Kreuznach (Brit. Mus. coll.), Mülheim near Cologne, rare, on the Ahr, at Boppard, Bingen and Trier, common, the mountains near Stolberg, near Cornelimünster, frequent, Schwelm, singly (Stollwerck), Hilden (Kirby), Hedwigsruhe near Neuenahr, abundant (Maassen), Krefeld, sometimes common, the Mündelheimer dyke, the Hülser marsh, the Budberger dyke (Rothke), Bonn, Aachen (Jordan); Hesse, local—near Wiesbaden, Biebrich, Mombach (Rössler), Hanau, the Steinheimer Forest, rare (Limpert and Röttelberg), the Vogelsberg, the Wetterau, Wehen, singly (Glaser), the Stadtwald, the Kettenh of meadows, near

Frankfort-on-Main, singly, the Seckbachhöhe, frequent, the Bieberhöhe, the Taunus, sparingly, Giessen, Marburg, Cassel, on the Bergstrasse (Koch), Grünberg, very rare, Winnerod, frequent, Darmstadt, rare (Glaser); Waldeck, local—near Wildungen, not rare, Rhoden, Arolsen, rare (Speyer); Thuringia, not rare—Mühlhausen, common, Jena, common (Speyer), Gotha (Knapp), Erfurt (Keferstein and Werneburg), the Steiger Forest, Willroda Forest (*Ent. Ver. Erfurt*), Zeitz-on-Elster, Raabe, Knittelholz (Wilde), Weimar (Speyer), Rudolstadt, Naumburg, Kyffhäuser, Nordhausen (Jordan); Anhalt, rare—Mosigkauer Haide, very rare (Stange), Gräfenhainichen (Richter); Hartz—on the foothills, *e.g.*, Asse, the meadows of the Hartz (Heinemann), Wernigerode, rather rare (Fischer), Göttingen (Jordan), Wildemann near Klausthal (Saxesen), Osterode (Jordan); Brandenburg, local—near Berlin, not rare, Brieselang (Pfützner), Rüdersdorf, Johannisthal (Bartel and Herz); Posen, rather rare (Schultz); Silesia, rare and local—the Trebnitz mountains, rare, Mittelwalde, the Schlesier Valley, rare (Döring), Bitke, not rare, Oels, Scarsine (Nohr), the southern part of Upper Lusatia only, Zittau Forest, at 2239ft., formerly at Herrnhut, 1120ft., in the Hutberg (Möschler), near Sprottau (Pfitzner), near Sagan (Kreutzmann), Bergisdorf (Pfitzner); Kingdom of Saxony, locally rare—Lössnitzgrund, Spechtritz, Weinböhla, Gröbern, the Spitzgrund (Steinert), Frauendorf-Frohburg, very rare, Leisnig, rare, Meissen, not frequent, Rotstein near Löbau, rare, Chemnitz, Limbach, Wolkenburg, Plauen, Lengenfeld, rare, near Dresden (*Ent. Ver. Dresden*); Bavaria, fairly common—Berchtesgaden (Lang), Regensburg (Hofmann and Herrich-Schäffer); the Allgau-Alps—Oberstdorf, Oythal, Sölleneck (Dadd), Münich, frequent, Augsburg near Siebentischwald, Siebenbrunnenfelder (Freyer), Kempten (Kolb), Kissingen (*teste* Rühl); Württemberg, locally common—Stuttgart, Tübingen, Reutlingen, etc. (Seyffer); Baden, distributed—Constance, the sources of the Donau, Freiburg, Schlossberg, near the Schönberg in thousands, Kaiserstuhl, frequent, Kippenheim, near Ettenheim, Carlsruhe, Heidelberg (Reutti), near Bruchsal, the Turmberg (Gauckler), near Lahr (Keynes); Alsace—Urttolsheim, by the banks of the Rhine (Peyerimhoff). Greece: Parnassus (Staudinger), Morea (Brit. Mus. coll.), Corfu—San Salvatore (Norris. Italy: Liguria throughout Piedmont, Lombardy, the Appenines, to Sicily—Piedmont—Certosa di Pesio (Norris), Turin (Swinton), Veneria (Rocci), Val d' Aosta — Chatillon (Fountaine), Courmayeur (Tutt), Varallo, Orta (Lowe), Chiesa, Susa district (Rowland-Brown), Sta. Maria, near Susa (Lowe); Tuscany—Pistoiese Appenines, very common, Arezzo, Casentina (Verity), Boscolungo (Norris), Livorno (Calberla), Florence, Monte Cerceri, Trespiano (Stefanelli); Lombardy (Turati), Como (F. B. White); Roma—Rome (Verity); Emilia—Modena (Verity); Campania—Naples, common (Oberthür), Castellamare d'Italia (Oberthür), Capri (F. B. White); Sicily—Monte Cuccio, Vallecorta, Palermo, Ragusa (Minà-Palumbo), Catania, Messina, Castellacio, Syracuse (Zeller), Madonie (Failla-Tedaldi). Luxembourg: Dommeldange, Bonnevoie, banks of the Alzette, Schengen (Dutreux). Netherlands: Limburg (Maurissen), Rothem in Geulheim (Snellen). Portugal: Setúbal district—Mt. dos Carvalhos, Almetao, Commenda, Quinta do Conceiçās (Vielledent). Roumania: common throughout—the Upper Moldau, near Azuga, Laculitz, Berglehenen, the Dobrudscha (Caradja), Tulcea, Valeni (*teste* Rühl). Russia: Baltic Provinces, local—Strickberg, Sessau, Schleck, Riga, Bullen, Groesen (Nolcken); Pskov (Kusnezow); Government of Moscow—near Tambow (Assmuss); Government of Poltawa (Markoff); Black Sea district—Podolia, Bagovitza (Grum-Grshimailo); Ural district—the Ural Mountains (Bartel), Miisk, Mioico (Grum-Grshimailo), Casan, Orenburg, and Saratov districts (Eversmann); Caucasia—central Caucasus (Schaposchnikov); Transcaucasia—Tiflis, Borjom, Guetchinan (Romanoff). Scandinavia: Sweden, north to 61°N. lat., to the Dal river, Upland (Aurivillius), Ledberg, West Gottland (Lampa), Upsala, frequent (Dalman), Småland, Trolle (Ljungh), Gottland, Stockholm (Wallengren), Lund (Zetterstedt); Norway Trolle (Ljungh), to 67°N. lat.—south and central, not common—Saltdalen 66° 30'-67°N lat. (Sparre-Schneider), Christiania (Wallengren), Torm (Salvin), in southern Lapland, rare—Westmannia (Thunberg); Finmark—Bödö (Nicholson), northeast Skania (Wallengren), Akershus, Hedemarken, Buskerud, Jarlsberg, Laurvik, Lister, Mandal, Stavanger, north Trondhjem, south Bergenhus, Nordland, Tromsö (Schöyen), Hamar-on-Mjösen (Wocke), Kalfaret near Bergen, Levanger, Alsterhang, in the Isle of Alsten, off Helgeland (Siebke). Spain: [Old Castile—La Granja, small (Lowe);] Andalusia—Alfakar, Granada (Rambur); Catalonia—Montserrat, Collbato (Cuní-y-Martorell); Teruel—Albarracin, Gea, Rodenas (Zapater); Asturias—Picos de Europa (Oberthür); Leon—Bejar (Chapman).

Switzerland: generally common, and extending up to 8000ft.—Geneva district, Versoix (Muschamp), Hermance, Bois des Frères, Chambésy (Reverdin); Valais—Great St. Bernard (Bethune-Baker), Martigny (Blachier), Savièze (Rehfous), Vernayaz (Wheeler), Leuk, the Gemmi Pass (Jones), Bérisal, the Laquinthal (Wheeler), Simplon (Rosa), the Ganter Bridge, Alpien, the Rossboden-Alp (Rehfous), Randa (Reverdin), Zermatt (Lemann), Riffel Alp, 8000ft. (Bethune-Baker), Vissoye (Chapman), Binn (Blachier), Fully, Mont Chemin, Great St. Bernard, Pierre-à-voir, Col de la Forclaz, Bovine, Saillon, Sion, Sierre, Chandolin, Zinal, St. Nicolas, Brigue, Mayenwand, etc. (Favre); Rhone Glacier (Brit. Mus. coll.), Glacier du Trient (Page), Saasthal—Saas-Fée, on the Langeflüh (Rowland-Brown); Saas-Grund, Hüteck, Useigne, Evolène, Arolla, Ferpècle Valley, Col du Torrent (Tutt); Vaud—St. Georges, Eclépens (Wheeler), Dent du Midi (Muschamp), Villeneuve (Reverdin), Frenières-sur-Bex (Blachier), Rhone valley, Sépey (Lemann), between St. Maurice and Lavey (Hutchinson), Lavey Wood, Bex, Territet (Tetley), Aigle (Gurney), Veytaux (Wheeler), Rochers de Naye, Glion (Chapman); Schwyz—Brünnen (Jones); Glarus—Glärnisch (Muschamp); Uri—Andermatt, Göschenenthal (Tutt); Bern—Kandersteg, Mühlenen (Jones), Macolin (Lowe), Wengen, Kleine Scheidegg (Moss), Meiringen, Grindelwald, Mürren, Engstlen Alp (Bethune-Baker); Basle—Basle (*teste* Rühl); Zürich—Zürich (Frey); Unterwalden—Pilatus (Keynes), Engelberg (Bethune-Baker); Grisons—Arosa (Jones), Stein-am-Rhein (*teste* Rühl), above Lavin, Roseg Valley (Tutt), Pontresina (Lemann), Tuors Pensch, Bergün (Zeller), Preda, the Weissenstein (Tutt), Maloja Valley—St. Moritz (Bethune-Baker), Maloja (Brit. Mus. coll.), Heuthal, Bernina Pass (Bethune-Baker); Ticino—Airolo (Godman), Piora, common (Tutt), Campolungo Pass (Muschamp), Chiasso district, common (Knecht), Locarno (Chapman); Solothurn—Dorneck Castle near Dornach (Leonhardt).

Tribe: Plebeiidi.

We have already seen (*Nat. Hist. Brit. Lep.*, viii., pp. 82, 303) that *Plebeii* is the oldest group name in which the Ruralids were included (*Sys. Nat.*, 10th ed., p. 482), although *Rurales* was the first under which the "coppers," "blues," and "hairstreaks," were separated from the "skippers" (*op. cit.*), Linné, in 1758, dividing the *Plebeii* into—

(1) Plebeii rurales (p. 482),
(2) Plebeii urbicolæ (p. 484).

At this date, however, Linné made no further use of his subdivisions, but prefaced each species in the two groups with letters "*P.P.*," writing in full the names thus contracted at the top of each page "Papilio. Plebejus." Each species, therefore, of this large group Plebeii, was termed (1) a *Papilio*, (2) a *Plebeius*, and the species became "Papilio, Plebeius, Argus," etc. Thus Linné applied the name *Plebeius* to each species in the sense of a modern generic name, indicating however, at the time, that the group was capable of further subdivision. This further subdivision was logically carried out by Fabricius, who, in 1775, designated (*Sys. Ent.*, p. 518) the whole group, after Linné, as Plebeii, but designated each species as "Papilio. Plebeius. Ruralis," thus raising *Ruralis* to the next group value above a species, *Plebeius* being retained in our sense of a tribal, and *Papilio* as a superfamily name. The indication, however, had been made by Linné, in 1767, when he indicated at the top of each page of the *Systema Naturae*, xiith. ed., pp. 787-793, "Papilio. Plebeius. R.," but only applied the letters "P. P." to the individual species. The fact that *Rurales* was the first name under which the "coppers," "blues," and "hairstreaks," were separated as a group from the "skippers," led us, as noted above, to adopt (*anteà*, vol. viii., pp. 298 *et seq.*) the name Ruralides as the superfamily name for this group. In its first heterogeneous use, therefore, Linné created the name *Plebeii* for the Ruralids and Urbicolids combined, and in this sense it was used by Müller, Pallas, Fabricius, Esper, Goeze, Haworth, and others, but, in 1798, Cuvier restricted it (*Tabl. Elem.*, p. 591) to the Ruralids, so that PLEBEII became synonymous with the PLEBEII RURALES of Linné, and cited *Papilio argus*, L., as a type of the *Plebeii*, whilst he carried over the PLEBEII URBICOLÆ of Linné to the name *Hesperia*, Fab., citing as a type of the latter *malvae*, L. (*op. cit.*, p. 588). This action was followed by Latreille, in 1802, when he subdivided (*Hist. Nat.*, iii., pp. 397-8) the PLEBEII of Linné into—

1. Les petits porte-queue. Example *Papilio pruni*, Linn.
2. Les argus. Example *Papilio argus*, Linn.
3. Les bronzés. Example *Papilio virgaureae*, Linn.—

so that, by this time, the French authors were entirely modifying the original use of *Plebeii*, and substituting this name for the original *Rurales* which they were allowing to lapse.

Previous to this, however, in 1780, Kluk,* after briefly describing the butterflies in general, says (*Zwierz. Hist. Nat.*, iv., p. 81) that they are to be grouped in five genera, the last of which is—

> Genus V. PLEBEIUS divided into—
> RURALES—*Plebeius cupido*, etc.
> URBICOLÆ—*Plebeius comma*, etc.

Practically, this is identical with Linné's use of the name in the *Sys. Nat.*, ed. x., and with Müller's in the *Faun. Ins. Frid.*, pp. 37 *et seq.*, but Kluk calls it (and his other divisions) a genus, whilst Linné called the whole superfamily *Papilio*, the genus (*i.e.*, "kind"). Here was already a modification of the original idea of the "genus," carried out by Latreille and others shortly after to its ultimate end, *viz.*, that, in classification, the genus should not, as indicated by Linné, be the name of the "kind" or "sort" of insect being dealt with—"butterfly," "beetle," etc., subdivided, as knowledge grew, into families, subfamilies, and tribes, but that it should be the "lowest," not the "highest" group name, and rank next only above the species. The fact that all the early names were really intended by Linné (and others) as descending group names is shown by the almost uniform punctuation —"PAPILIO. PLEBEIUS," "PAPILIO. PLEBEIUS. RURALIS," etc. Here, then, we have shown that Linné, Müller, and Kluk, used *Plebeius* in the modern generic sense, the latter terming it "genus." Kluk, however, used the name in quite as heterotypical a manner as did all the early authors, and it was not until 1872, that Crotch (*Cistula Ent.*, i., p. 60) indicated *argus*, Linn., as the type of the genus, erroneously supposing that Cuvier had already done so in 1798, when, in reality, the latter only noted it as an example of the whole group—

> Les Plébéiens—*Plebeii*—*Papilio argus*—

and did not use it at all generically. After Crotch's indication, Kirby, in 1896, definitely fixed the type as *argus*, Linn. (=*aegon*, Auct.). The tribal name, therefore, that we have selected for the purpose of grouping together a great number of close-allied genera, comprising, in fact, a large proportion of our Palæarctic species, is to be traced back to Linné.

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* We have never been able to see this work for ourselves, and are entirely indebted to Mr. L. B. Prout, for the information relating to the use of the name *Plebeius* by this author.

It would appear that Scudder's diagnosis of the genus *Rusticus* (*Butts. New Engl.*, ii., pp. 957 *et seq.*) covers the whole tribe, and that it is really a description of our *Plebeiidi*. It reads as follows:

Imago: Head small, densely covered with scales, which form a tuft behind the antennæ; provided also sparsely on the upper half of the front, with short, curving, erect hairs. Front flat, very slightly tumid beneath, scarcely surpassing the front of the eyes; above hollowed in the middle, with a broad longitudinal groove; scarcely half as high again as broad, fully as broad as the eyes; the sides parallel, the upper border squarely excised, its angles rather largely hollowed in front of the antennæ; lower border strongly rounded. Vertex not tumid, well rounded longitudinally, rather suddenly and broadly elevated behind the antennæ, as their support; separated from the occiput by a not very distinct, because tortuous, broad, and not very deep transverse channel, the sides of which, about equally abrupt, form a right angle with each other; occiput longitudinally excised in the middle. Eyes not very large nor full, entirely naked. Antennæ inserted rather in advance of the middle of the summit, separated by a space barely equalling the diameter of the first joint, scarcely longer than the abdomen, composed of about thirty-two joints, of which the last twelve or thirteen form the club, which is nearly three times broader than the stalk, four or five times longer than broad, very gradually increasing in diameter, the last two joints forming the bluntly-rounded tip. Palpi slender, compressed, nearly, if not quite, twice as long as the eye, the terminal joint very slender, scarcely more than one-third as long as the middle joint, and clothed only with recumbent scales; other joints heavily scaled, and also thinly fringed with rather long, forward-reaching, erect, coarse hairs, narrowly compressed in a vertical plain. Patagia scarcely tumid, a little arched, slender, about two-and-a-half times longer than broad, the inner border considerably curved, the outer bent, tapering considerably, but the apical two-fifths equal, moderately slender, bent a very little outward, and bluntly rounded at tip. Forewing fully three-fourths as long again as broad, the costal margin strongly, and rather abruptly, convex at base, beyond nearly straight, scarcely convex, the extreme tip sloping downward; outer margin rather strongly and regularly convex, its general direction at an angle of about 55° with the middle of the costal border, the upper angle abrupt but rounded, the lower well-rounded off; inner margin straight. Costal nervure terminating a little before the tip of the cell; subcostal with three superior branches; first arising a little beyond the middle of the cell, second at nearly one-third the distance from this to the apex of the cell, the third as in *Nomiades*, but forking before the middle of its course; veins closing the cell excessively feeble throughout, bent at a slight angle; cell somewhat more than half as long as the wing, and fully four times as long as broad. Hindwings with the costal margin a little convex on the basal third, beyond scarcely convex, the outer margin well-rounded, fullest in the anterior half, and especially in the ♀, the inner border a little convex, the apical half slightly excised, the angle very broad, rounded off. Submedian nervure terminating at the anal angle; internal nervure terminating a little beyond the middle of the inner border. Androconia flattened, oval in shape, almost alike at the two ends, the pedicel scarcely tapering. Fore tibiæ a little more than five-eighths the length of the hind tibiæ, the tarsi either scarcely (♂), or nearly one-third (♀) longer than the tibiæ, but tibiæ and tarsi combined, about equal in the two sexes; apical appendages of the last tarsal joint either like those of the other legs (♀), or the claws connate, forming a single conical, appressed hook, broad at the base, scarcely curving, longer than normal, and the paronychia and pulvillus wanting (♂); in other respects the forelegs do not differ materially in structure from the other legs, but they are shorter, not quite so crowded with spines, those of the tibiæ being very few and scattered, and the tibial spurs, although not small, are naked. Middle tibiæ scarcely four-fifths the length of the hind tibiæ, and armed beneath with a double row of short, very distant, delicate spines, and at the tip with a pair of not very long, scaly spurs. First joint of tarsi nearly equalling all the rest combined, the second, third, and fourth diminishing regularly, the fifth scarcely so long as the second, all furnished beneath with a mass of long and slender, crowded, tapering spines, mostly confined to two rows beyond the basal joint, the apical ones of each joint longer, spur-like; claws small, moderately slender, rather strongly, but not regularly, curved, being bent before the middle, and slightly hooked at the tip, tapering, finely pointed, and having at the base a large, rounded, slightly produced, compressed lobe; paronychia double, the superior lobe nearly as long as the claw, tapering, slender, but little curved, the inferior nearly as long and slender, nearly equal, bluntly pointed, curving a little inward, and strongly forward; pulvillus wanting. Male abdominal appendages with the lateral alations extended backward as parallel, tapering spines, slightly bullate at base, the lateral arms excessively slender, long, and delicate, bent about the middle. Clasps of unusual breadth and uniformity, terminating in a very blunt angle and a double point.

Egg: Twice as broad as high, flattened, turban-shaped, the upper surface almost perfectly flat, and extending far towards the strongly convex sides; lower surface scarcely arched; sides covered with a tracery of subtriangular or triangular cells with compressed, equal walls, considerably thickened but scarcely elevated at the points of convergence of the lines of the triangles. Above, the cells are smaller and more rounded (subcircular or oval), the walls thicker and lower, and entirely uniform in height, with no such enlargements at the junction of lines. The micropyle rosette is a sunken basin of entirely similar cells, but on a diminutive scale, and forming only a delicate tracery.

Caterpillar at Birth: Head generally wholly exserted, deeply cleft posteriorly between hemispheres, a little angulate at its widest part; frontal triangle very large, considerably more than half as high as the head, and much higher than broad. Body triangularly subcylindrical, the dorsal region narrowly depressed, the first thoracic segment more arched, the last abdominal segment greatly flattened, with a transversely oval, sunken, central, chitinous area. Legs rather long and slender, with slender, curving, pointed claws. Whole surface of the body scabrous, with minute stellate papillæ. The following is the arrangement of papillæ and annuli in which all the serial hairs are blunt tipped; first thoracic segment with a strongly arcuate series of eight or nine papillæ, bearing forward-curving, spiculiferous hairs; on either side an oblique row of three similar papillæ, and, enclosing posteriorly in the arcuate embrace of the first mentioned, a number of larger and smaller chitinous annuli in three short, transverse rows, the hindmost containing also a pair of laterodorsal, hair-emitting papillæ. Second thoracic segment with a pair of laterodorsal, anteriorly placed, and bearing forward-curving, long hairs, a similar lateral pair, and a single anterior infralateral circlet besides the appendages to be mentioned. The eighth abdominal segment has a conspicuous, strongly arcuate series of numerous papillæ, the concavity forwards, the papillæ irregularly ranged, and each bearing a backward-sweeping hair. Common to many segments are the following: a laterodorsal series of closely anterior, small annuli, from the third thoracic to the seventh abdominal segments inclusive, high, central, laterodorsal papillæ, with a very long hair, backward-sweeping and curving hair on the second thoracic to the eighth abdominal segments, those on the thoracic segments more widely separated than on the abdominal; small papillæ with comparatively short, backward-directed, subrecumbent hairs just behind the preceding, on the second thoracic to the sixth abdominal segments; next, a lateral series of anterior central, large annuli (becoming infralateral on the third thoracic, high supralateral on the sixth to eighth abdominal, and very large on the sixth abdominal segments), extending from second thoracic to the eighth abdominal segments; an infralateral series of smaller circlets on the first to seventh, but becoming larger and lateral on the sixth to seventh abdominal segments; a laterostigmatal series of minute annuli, two to a segment, the anterior the lower, on the first six abdominal segments, found also, but carried higher up, and the hinder greatly enlarged on the seventh abdominal segment; also on the second thoracic segment, but at same level, and the anterior one only; finally, a ventrostigmatal series of three high papillæ, each bearing a hair, placed in an oblique series; the anterior lowest, and bearing a comparatively short, straight, granulated hair, directed outward and a little forward; the middle a larger, straight, granulated hair, directed outward; and the posterior the shortest, a gently curved, gently clubbed, smooth hair, directed backward and outward.*

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* Scudder notes that his plate 71, fig. 4, is wrong in making the infralateral and laterostigmatal lenticles into short, bristle-bearing papillæ. In reference to this note of Scudder's, it is true of *argus* (*aegon*) and *argyrognomon* and, in fact, of all the *Plebeii*, as well as in Celastrinids and Everids, that those two short bristles *are* short bristles as figured by Scudder, and *not* lenticles, so that it is extremely improbable that they are lenticles in *P. scudderii*. They are certainly very difficult to define accurately, being very minute and very transparent, and in any preserved

Mature caterpillar: Head well rounded, higher than broad, deeply and broadly cleft above between the hemispheres, so as to barely escape reaching the summit of the frontal triangle; the latter half as high as the head, and higher than broad; ocelli composed of five equal, equidistant, roundish oval lenticles forming the quadrant of a circle, with a sixth similar one at its centre. Body high, tectiform, the summit depressed in a narrow dorsal area, which broadens a little on the thoracic segments; anteriorly, it falls off rapidly, and posteriorly, the body becomes depressed, and the last segment well-rounded. Viewed laterally, the summits of the segments are prominently moniliform, with distinct, elevated, subdorsal papillæ in the stages following the first, which are lost in the last stage, when the body is covered with a promiscuous assemblage of equally, and rather closely distributed, very short and unequal, pointed hairs, arising from small, stellate papillæ. A transverse slit in the middle of the dorsum of the seventh abdominal segment appears in the third stage, but apparently the caruncles of the eighth segment do not appear until the fourth stage, when they are wider apart than in *Cyaniris*. Spiracles exceedingly minute, slightly oval.

Chrysalis: Long and slender, being about three times as long as broad; viewed from above the sides are straight and slightly divergent along the line of the wings, beyond which the abdomen forms a regular elliptic curve; the basal wing-tubercle is tolerably prominent, but well-rounded, the prothorax being considerably narrower than the body at the wing-base, and in front roundly and shallowly emarginate. Viewed from the side, the thorax is highest a little behind the middle of the mesothorax, behind which it is almost level, and in front of which it slopes regularly and rapidly to the base of the antennæ. Abdomen but little higher than the thorax, highest at the third segment, very broadly arched, but at last falling off rapidly behind, exactly as in *Cyaniris*; transversely it is cylindrical, but the sides of the mesothorax slope toward each other at an angle of about 85°, the summit well-rounded. Tongue exposed three-fifths way to tip of antennæ. Body covered with a reticulation of raised lines much as in *Cyaniris*, but more delicate, and the hairs much shorter and blunt-tipped. Hooklets of cremaster with a slender, gently arcuate, rather long stalk, rapidly expanding and curved over into a rather tight roll at the tip, the outer apical angles produced into a tiny claw.

Our knowledge of the relationships of the various genera included in this tribe is infinitesimal, our ignorance colossal, and we can here only indicate some of the self-evident sections, a later knowledge of the detailed structure of the species of which, in all their stages, will alone allow them to be defined with greater accuracy. It were easy to follow the well-patronised method of ignorance, and include them all in one omnibus "genus," or even to pretend knowledge by subdividing such a "genus" into numbered groups without definition. Our various references to different species, in this, and the preceding volumes, will have made our readers conversant with the names of some of these sections, *i.e.*, genera, which we may here illustrate by reference to the British, and some of the better-known Palæarctic species referable thereto, especially such as have come under our notice alive. We may thus note—

Plebeius—*Plebeius argus* (*aegon*) (type), *P. argyrognomon*, *P. lycidas*, etc.

Vacciniina—*Vacciniina optilete* (type).

Aricia—*Aricia astrarche* (type), *A. psylorita*, *A. idas*, *A. eumedon*, *A donzelii*, etc.

Cyaniris—*Cyaniris semiargus* (type), *C. persephatta*, etc.

Polyommatus—*Polyommatus eros*, *P. icarus* (type), *P. amanda*, *P. escheri*, *P. hylas*.

Hirsutina—*Hirsutina damon* (type), *H. dolus*, *H. admetus*, etc.

Albulina—*Albulina pheretes* (type).

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specimen become, as time goes on, more transparent and more invisible. The conclusion one arrives at as to *P. scudderii*, then, is that the figure is correct, but on comparing it later with the (preserved?) specimen, the hair-bases, resembling lenticles, were seen, but the hairs themselves could not be detected.

PLATE **XX**.

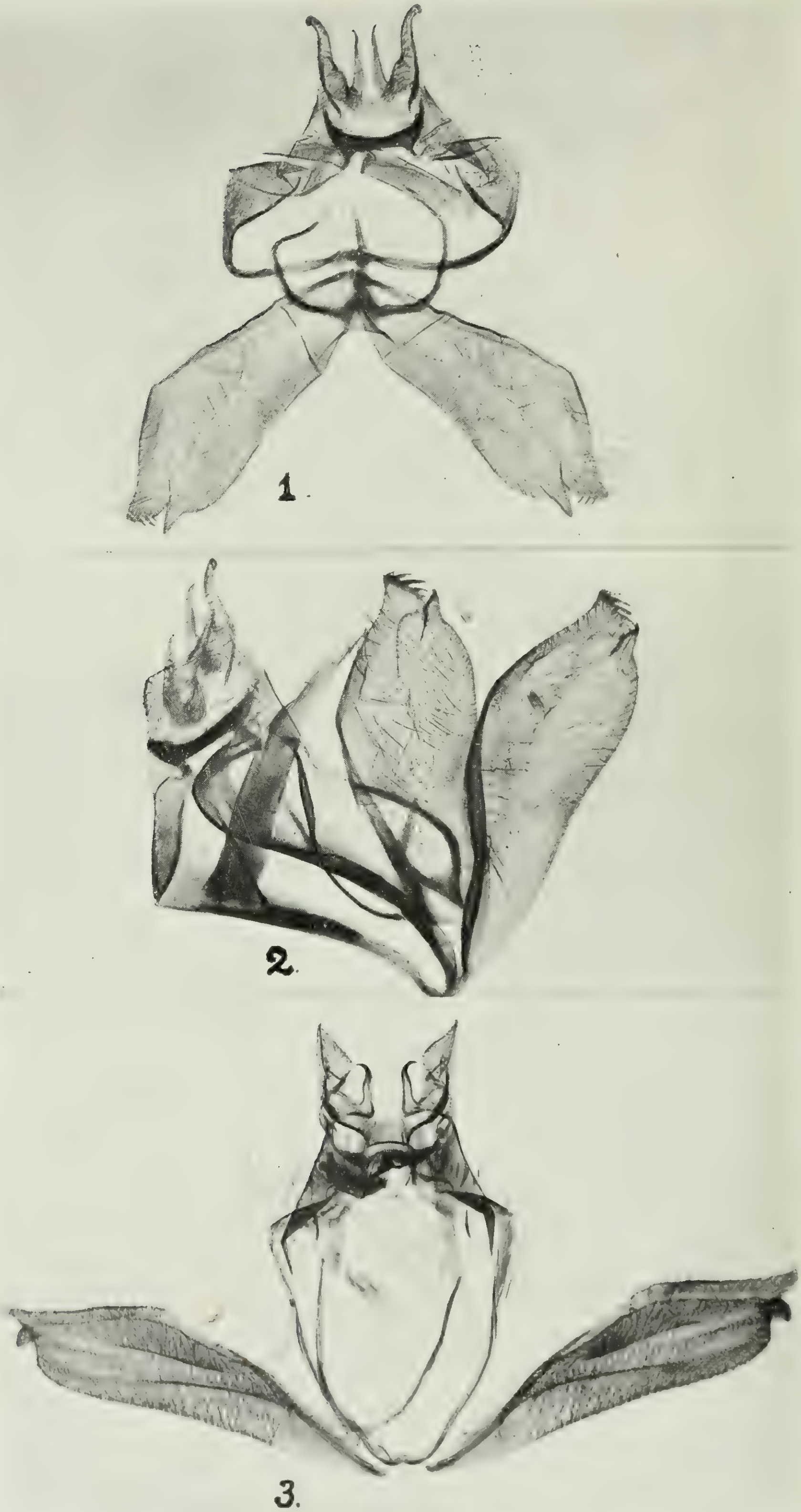

Photo. F. N. Clark.

COMPARATIVE VIEW OF ANCILLARY APPENDAGES OF THE GENERA PLEBEIUS AND AGRIADES.

1. PLEBEIUS ARGUS × 20. 2. PLEBEIUS ARGUS (LATERAL) × 25.
3. AGRIADES CORIDON × 16.

LATIORINA—*Latiorina orbitulus* (type), *L. pyrenaica*, etc.
AGRIADES—*Agriades meleager*, *A. coridon* (type), *A. thetis* (*bellargus*), etc.

Having indicated in this manner the groupings into which the species with which we are most conversant in the field seem to fall, and which appear to be supported by much more abundant material in the British Museum collection, we appealed to Dr. Chapman for information as to how far the genitalic characters would bear out these groupings. He very kindly examined the genitalia of the above-named, and other, species. The information he is able to afford supports, to some extent, our grouping. He notes that "the Plebeiid 'clasp' varies little throughout the group, and is very unlike that of any other group. It is to be observed, also, that, in most groups, the dorsal armature is most constant, *i.e.*, generic, the clasps the most varied, *i.e.*, specific. In the Plebeiids, the contrary is the case. The Plebeiids have, as their most characteristic feature in the ancillary appendages, a clasp, large, tapering a little to each end, so that in most views its outline is fusiform, each clasp quite separate from its fellow, and with the two divisions into which the clasp, in not a few Lycænids, is divided, only distinct at the very end. It is further characteristic that this clasp is so uniform throughout the group, that it is only by minute details that one species can be distinguished, in many cases, from another. Yet, so far as I know, this form of clasp does not occur in other families of blues. The dorsal portion of the armature, consists of two lateral portions connected across the actual dorsum by a comparatively narrow and featureless strip of chitin, less reduced, however, than in *Celastrina*. Each side has a rather long process, clothed with hairs, and of by no means simple structure. Attached to the base of this is a smooth hook, so articulated as to have considerable freedom of movement. The base of the hook is more or less swollen, and extends somewhat transversely to the dorsal process, then with a bend which may be a right angle, or even nearly 180°, the rest of the hook extends more or less parallel to the dorsal process on its dorsal side. It is the size and form of this hook, and its relation to the dorsal process, that affords the easiest characters to seize for the subdivision of the *Plebeiidi*. In favour of the subdivision of this large group into separate genera, as proposed by Mr. Tutt, I may note, as I have occasionally remarked in previous studies, that the dorsal armature affords the generic characters, the clasps the specific. If we were to retain *Plebeius* as a genus to include all the species, this would not be so, the clasp, in that case, being unquestionably the generic character. By dividing the group into several genera, we are forced to use the dorsal armature for the generic character, rather than the clasps, and revert to the latter for specific ones. This is, of course, a very general statement, and neglects various individual exceptions. The following points on the groups indicated, may prove of interest:—

PLEBEIUS: We are met, at the outset, with a question of some difficulty. *Plebeius* has, it appears, as type, *argus*, Linn. (*aegon*, Schiff.). With this has always been associated *argyrognomon*, Bergstr., and the difficulty has usually been regarded in respect of these two species, not how to unite them generically, but how to separate them even specifically. When we examine the ancillary appendages, we find that these two species differ from each other more decidedly than do almost any other two species of Plebeiids, and in so differing they are also easily distinguishable from all other Plebeiids (with which I am familiar). To retain them in the same genus, we must assume that they left the central forms together, and since differentiated; this is by no means improbable. On the other hand, when we note how many pairs of blues there are that resemble one another extremely, and yet are comparatively unrelated [*Cupido minimus* (and still more its congener *C. sebrus*) and *Cyaniris semiargus* are the best examples British species afford], we cannot help speculating whether this be not another instance. In other words, were *argyrognomon* and *aegon* one species which divided into two, acquiring hardly any general characters to distinguish them, but becoming very different in the ancillary organs? Or were they two very different species (in facies) derived from different points of the Plebeiid tribe, that were forced to acquire a very similar facies? In the former case they form one genus, in the latter they do not. Since there is no strong argument to be advanced on either side, it seems proper to leave the present belief in their close relationship undisturbed, and let them remain together, and note any details in support of it. *P. argus* (*aegon*) is characterised by the length and slenderness of both the dorsal process and the upright portion of the hook. The dorsal process is also curved in such a way that, when the parts are flattened, as occurs when mounting them on a slide, the dorsal armature has the closest resemblance to the harp-like tail of the lyre-bird, or perhaps one ought to say to the conventional harp that that tail so closely imitates. The end of the clasp in *argus* (*aegon*), has, where other species have fine serrations along the spiracular branch, very large and coarse spines, such as few other, and no British, Plebeiid has. In view of the contention that *argus (aegon)* and *argyrognomon* have but recently separated, it is well to note that this armature of spines is very variable. The spines may be four, five, or six in number, and there may or may not be present at either end of the series, small teeth, minute in comparison with the great spines, but large in comparison with the fine teeth usual in Plebeiids. When we come to *argyrognomon*, we find the serrated edge of the spiracular branch of the spine is not orientated obliquely or towards the middle line of the clasp, but is transverse, again unlike other Plebeiids, whilst the teeth are distinctly larger than usual, and again show considerable variation in size, always, however, ranging in order of size with other Plebeiids, rather than with *argus (aegon)*. *P. lycidas* agrees fairly with *argus* (*aegon*) in the dorsal armature, but is almost as near to *Polyommatus icarus* as to this group in the serrations on the clasp. These are very fine, the alliance to *Plebeius argyrognomon* is to be found in the fact that the serrated margin is terminal and somewhat rounded, so that the end of the margin looks outwards from the middle line of the clasp.

Aricia: After *Plebeius*, this seems to be the most separable and distinct section (with British representatives) of the tribe. It may be defined as the group whose larvæ feed on *Geraniaceae*, and includes *astrarche*, *idas*, *donzelii*, and *eumedon*. Taking *A. astrarche* as typical, we find it has a comparatively very small hook to the dorsal process, and possesses, on the body of the clasp, in a longitudinal line, a number of rough spinous processes. The other three species illustrate both the strength of the ancillary appendages as proving relationships, and the weakness inherent in reliance on one character. The appendages are, however, a whole group of characters. We find *idas* and *donzelii* are almost identical with *astrarche* in the smallness of the hook of the dorsal process. But stimulating the imagination as much as may be by strenuously regarding *astrarche*, fails to enable me to see any rough processes on the clasps of these two species. They are present, however, in *eumedon*, but here we find the dorsal armature somewhat different, and the hook by no means a small one, still less minute.

In dividing up the remainder of the species, it is less easy to give crisp characters, as there is much variability within very narrow limits.

Vacciniina: As exemplified in *optilete*,† the ancillary appendages agree with *Aricia* in having the serrate process of the clasp much larger than the soft one. It disagrees with *Aricia* in that the dorsal process is shorter and broader, and therefore more triangular.

Cyaniris: As exemplified by *semiargus* and *persephatta*, this group agrees also with *Aricia* in having the hard process markedly larger than the soft one, but

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† *V. optilete* is genitalically a very typical Plebeiid, much nearer to *icarus* than the appearance of the insect would lead one to suspect.—T.A.C.

PLATE XXI.

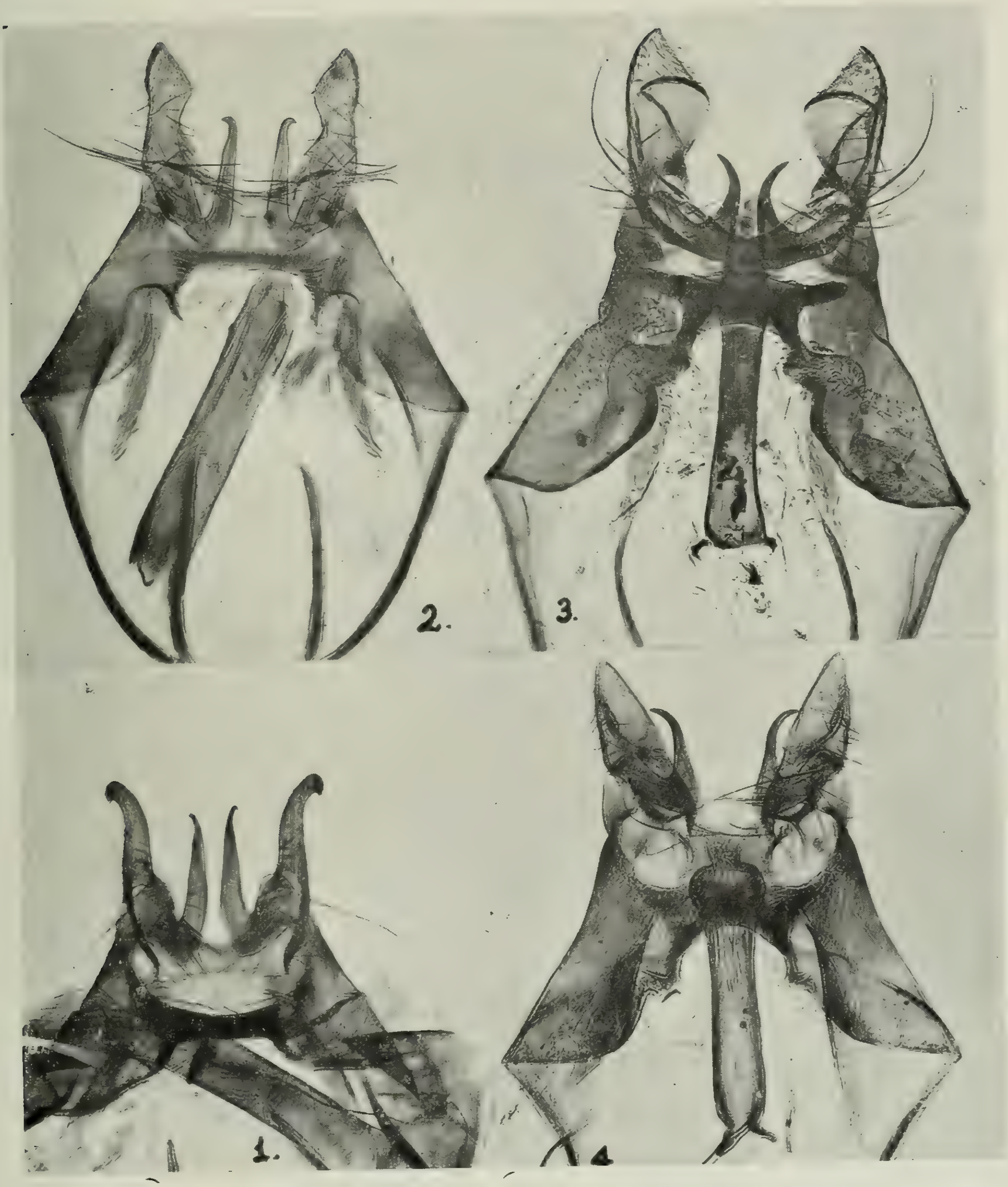

Photo. F. N. Clark.

COMPARATIVE VIEW OF DORSAL PORTION OF ANCILLARY APPENDAGES OF PLEBEIID GENERA.

1. PLEBEIUS (ARGUS). 2. CYANIRIS (SEMIARGUS). 3. POLYOMMATUS (ICARUS).
4. AGRIADES (THETIS) (ALL × 35).

A Natural History of the British Butterflies, etc., 1909. [*To face p.* 156.]

Plate XXII.

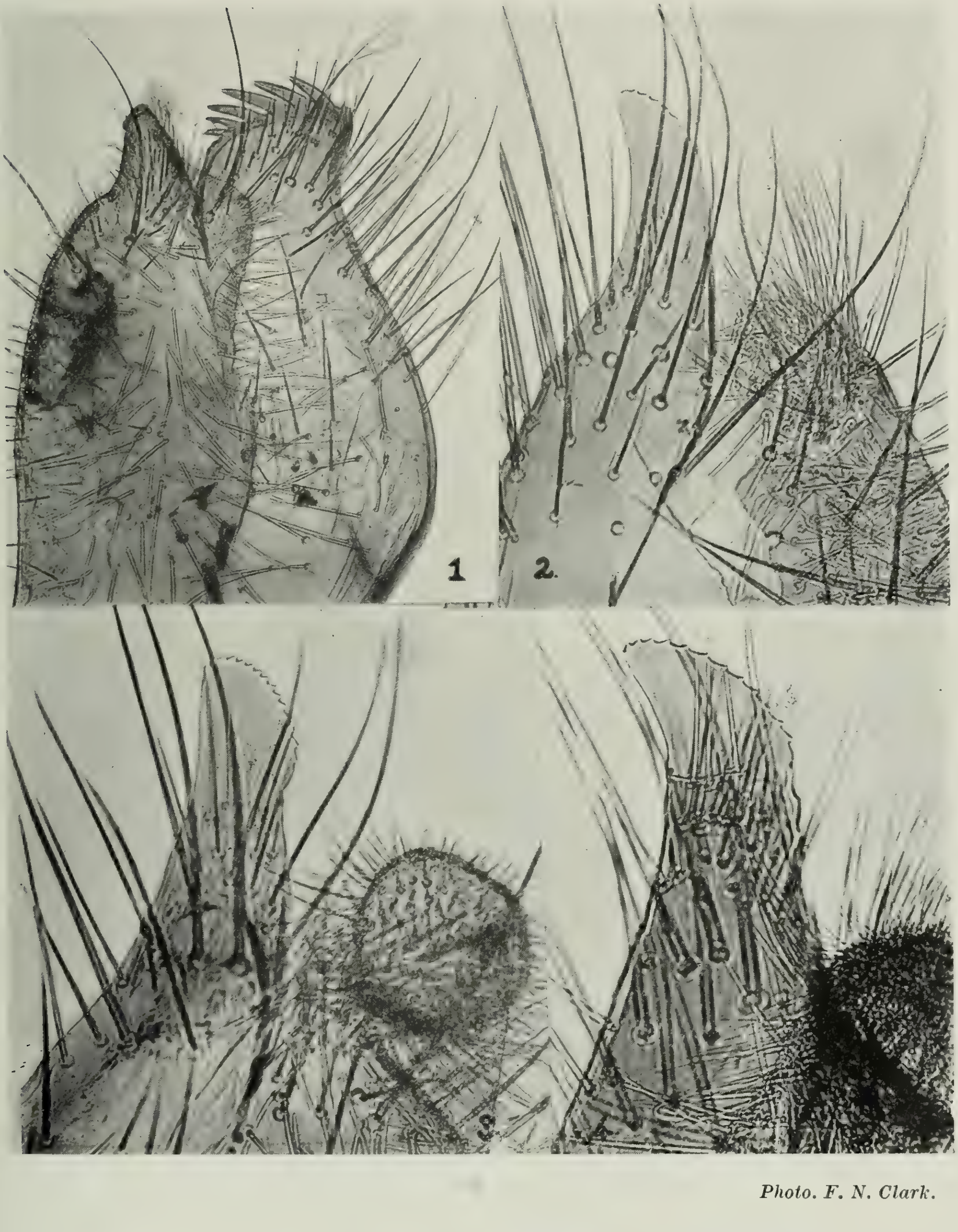

Photo. F. N. Clark.

Comparative view of tip of the ancillary clasp in allied Plebeiid genera.

1. Plebeius (argus) × 70.
2. Cyaniris (semiargus) × 140.
3. Polyommatus (icarus) × 140.
4. Agriades (coridon) × 140.

it has a more special character in the hook of the dorsal process being folded at the bend to about 170°, *i.e.*, the base and upper part almost folded together.

ALBULINA: As exemplified in *pheretes*, this group agrees with *Aricia* in the general form of the long, hard process of the clasp, but has the hook of the dorsal process with a very broad, square base, and the upper portion thick below, tapering, and ending in a slight hook.

LATIORINA: As exemplified by *orbitulus* and *pyrenaica*, this group is very near *Albulina*, but the dorsal hook is less heavy, and more like that of *Polyommatus* (*icarus*). The hard process of the clasp is rather long, and the serrate margin extends round an almost circular termination.*

AGRIADES: As exemplified in *coridon* and *thetis* (*bellargus*), it is not so very difficult to separate this from *Polyommatus* (*icarus*), but, in other species that appear to have to be divided between these groups, the separation is much more so. This group exhibits a dorsal process with well-developed wing (as many others have, though occasion to refer to it has not before arisen); the hook has a large, square base, from which the comparatively slender, rather S-shaped, curved, upper part, arises at about a right angle, and ends opposite the middle of the dorsal process.

POLYOMMATUS: As exemplified in *icarus*, *eros*, etc., this group possesses a less heavy base to the clasp, a less slender upper portion, and its curvature is simple. In *Polyommatus* the hard process of the clasp is rather shorter than in *Agriades*. In both there is a soft process between the two divisions of the clasp; [it often swells out in preparation in a balloon-like way;] whether we regard it as a part of the soft process of the clasp, or a development of the membrane between the two processes does not much matter, but its considerable development (it occurs elsewhere) is characteristic of these two genera."

Chapman adds that, genitalically, our *Hirsutina* belongs strictly to *Polyommatus*, the *icarus* group. It seems, however, such a natural group in other respects, that one feels very constrained to treat it separately. It is to be noted that *Chilades* (*trochylus*) is Plebeiid.

A study of the material in the British Museum collection raises many and serious doubts as to whether the real evolutionary relationship of the very widely different species included in our genera of this tribe, would not be more properly indicated by their treatment as distinct tribes, but the genitalia give no indication in this direction, and these difficulties must be left for future consideration. As here treated, this huge tribe shows remarkable variations in all the details relating to the habits and structure of the individuals included in its separate sections, or genera, remarkably uniform, however, as a rule, within the limits of each separate section. These details will be better dealt with in full, however, in our account of each separate genus.

We may merely note here that the Plebeiids are, in their larval habits, possibly the most generalised of all the Lycænids, feeding usually on the leaves of low leguminous plants, and hybernating in the third larval stadium, eating out, when young, little patches of the cellular tissue of leaves, which they pierce with their tiny head, and are able to scour with the long extensible prothorax, differing thus markedly from the seed-eating larvæ of the Lampidids, Celastrinids, and Everids already considered. But there are many exceptions to these general truths, for the larvæ of the Ariciids—*Aricia astrarche*, *A. eumedon*, etc., feed on *Geraniaceae*, etc., that of *Vacciniina optilete* on *Vaccinium*, whilst *Plebeius argus* (*aegon*), *P. argyrognomon*, *Agriades coridon*, etc., hybernate as eggs, or rather as fully-formed larvæ inside the egg-shell, and so on.

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* When Prunner named this species *orbitulus*, was he aware of this peculiarity which separated this species (and its allies) from the rest of the Plebeiids?—T.A.C.

The pupa is generally smooth, or nearly so, quite different, therefore, from that of the Everids (already described). Little seems to be known as to their habits of suspension, but most of the known species appear to pupate on, or near the surface of the ground, and, if suspended at all, to be usually attached to the cast larval skin by which the true suspension is then really made.

The imagines of most of the species, exhibit marked sexual dimorphism, the ♂ s being blue, the ♀ s brown, or brown marked with blue and orange. In most of the Ariciids, however, the ♂ s as well as the ♀ s are brown in tint, the brown usually relieved by orange or fulvous marginal lunules. The development of androconia in the blue ♂ s has been already remarked upon, but the furry "hair-scales" which are usually absent in the Lycænids (*sens. restr.*), Celastrinids, Everids, etc., are strangely present in some Plebeiids, and absent in others, apparently closely allied; Wallengren records them as failing in *Aricia donzelii*, *Latiorina aquilo*, *Vacciniina optilete*, and *Plebeius argus* (*aegon*), but as abundant in *Plebeius argyrognomon*. The development of these "furry hair-scales" in the discal cell, appears to be carried out to its greatest extent in *Hirsutina admetus*, where they extend far beyond the discal cell, whilst they are comparatively rare in the allied *H. dolus*, and *H. damon* is not so very largely provided therewith. On the other hand, *Agriades coridon* is quite as well-haired as *H. dolus*, this feature being particularly conspicuous in some of the large, pale, Spanish forms, in which they are developed, as in *H. admetus*, not only in the discal cell of the forewing, but also along the wing-nervures. They occur freely on *Agriades bellargus*, *Polyommatus amandus*, *P. escheri*, *P. icarus*, *P. hylas*, and *Albulina pheretes*, and, where they do not travel along the nervures, the latter are usually marked by special scales, showing, therefore, a tendency to differentiation along the nervures.

The general character of the underside spotting is similar in all, and the modifications, when they occur, readily traceable to the common pattern. The long white streak on the hindwing appears to be essentially Plebeiid, but is especially well-marked in *Aricia* and *Hirsutina*, traceable in *Polyommatus* and *Agriades*. The metallic kernels in the marginal spots of the hindwing towards the anal angle, are largely confined to the species of the genus *Plebeius*, though by no means entirely so, nor are they always found therein.

The habits of the Plebeiid imagines are very similar. Confined to low-growing plants, they haunt fields, meadows, pastures, waysides, heaths, moorlands, flying low down near the ground, or fanning their wings on flowers as they suck the nectar; the ♂ s are sometimes attracted in thousands to the sides of shallow streams, to springs and runnels that cross the pathway, on meadow, moor, and mountain, swilling in the hot sun, and forming a tiny cloud of lovely blue life when alarmed, returning again and again to the rendezvous if disturbed. By night they rest, usually head downwards, on the culms of grass and other low plants in sheltered spots near their foodplants; we have seen thousands of *Polyommatus icarus* and *Aricia astrarche* thus at rest on the marram grass in the hollows of the Deal sandhills; equally large numbers of *Agriades coridon* on the *Onobrychis*, *Ononis* and *Centaurea* plants, on the sheltered side of the large hollow near the South Foreland lighthouse.

and *A. bellargus* on the rough herbage of the chalk-hills at Halling. This gregarious habit seems to be common to most of our Palæarctic species.

The distribution of the Plebeiids, in their widest sense, is practically world-wide, and extends from the equator to well within the Arctic Circle, and from sea-level to far above the snow-line, 8000ft. to 10000ft., in Europe, and far beyond this in Asia and America, a ♀ *Latiorina aquilo* is recorded from 81° 45′, by Feilden (*Linn. Soc. Journ. Zool.*, xiv., p. 111); it was also one of the species obtained in Ross's voyage, being then described by Curtis as *Polyommatus franklinii*. An allied species, *Latiorina ellisi*, is recorded by de Nicéville from Sanch Pass, in Pangi, in the north-west Himalayas, at an elevation of 14000ft. (*Butts. India*, iii., p. 87). With such a range, the number of broods must vary considerably; in high latitudes and altitudes “forwards” are, of course, unknown, in temperate and subtropical regions they increase in number until many species become quite continuously-brooded.

Genus : Plebeius, [Linné,] Kluk.

Synonymy.—Genus: **Plebeius,** Kluk, “Zwierz. Hist. Nat.,” iv., p. 81 (1780); Crotch, “Cist. Ent.,” i., p. 60 (1872); Kirby, “Handbook Lep.,” ii., p. 87 (1895); Tutt, “Ent. Rec.,” vii., pp. 220, 340 (1895); “Brit. Butts.,” p. 182, pl. iii., figs. 6-7 (1896); Reuter, “Ent. Rec.,” x., p. 97 (1898); Tutt, “Ent. Rec.,” xii., pp. 38-9 (1900); xviii., pp. 130, 132 (1906); “Nat. Hist. Brit. Lep.,” viii., p. 313 (1906); “Ent. Rec.,” xxi., p. 58 (1909). [**Papilio-**] **Plebeius.** Linn., “Syst. Nat.,” 10th ed., p. 483 (1758); (?) †Poda, “Mus. Gr.,” p. 76 (1761); Müll., “Faun. Ins. Frid.,” p. 37 (1764); Linn., “Sys. Nat.,” 12th ed., p. 787 (1767). **Papilio,** Linn., “Fn. Suec.,” 2nd. ed., i., p. 283 (1761); Scop., “Ent. Carn.,” p. 177 (1763); (?) †Hufn., “Berl. Mag.,” ii., p. 72 (1766); Fuess., “Verz.,” p. 31 (1775); Harris, “Eng. Lep.,” p. 2 (1775); Schiff., “Schmett. Wien.,” pp. 183, 185 (1775); Müll., “Zool. Dan. Prod.,” p. 115 (1776); Schneid., “Sys. Beschr.,” p. 252 (1787); Lang, “Verz.,” 2nd ed., p. 55 (1789); Pezold, “Scriba's Beitr.,” iii., p. 234 (1793); Bkh., “Rhein. Mag.,” i., p. 289 (1793); Lewin, “Ins. Gt. Brit.,” p. 82 (1795); Hb., “Eur. Schmett.,” i., pl. lxiv., figs. 313-315 (1796); “Raup.,” i., pl. xxxix., figs. 2*a*, *b* (*circ.* 1800); Ill. “Schmett. Wien.,” 2nd ed., ii., p. 272 (1801); Hffmgg., “Ill. Mag.,” iii., p. 184 (1803); Lasp., “Ill. Mag.,” iv., p. 65 (1804); Herbst, “Nat. Sys. Ins.,” xi.. p. 239 (1804); Ochs., “Schmett. Sachs.,” p. 340 (1805); Hb., “Eur. Schmett.,” text, p. 50 (*circ.* 1805); Ochs., “Die Schmett.,” i., pt. 2, p. 57 (1808). [**Papilio-Plebeius-**] **Ruralis,** Fab., “Sys. Ent.,” p. 525 (1775); Göze, “Ent. Beitr.,” iii., pt. ii., p. 75 (1780); Bergs., “Nomen.,” ii., p. 77 (1780); Fab., “Spec. Ins.,” ii., p. 123 (1781); “Mant. Ins.,” ii., p. 74 (1787); Bkh., “Sys. Beschr.,” i., p. 154 (1788); ii., p. 225 (1789); De Vill., “Car. Linn. Ent. Fn. Suec.,” ii., p. 66 (1789); Schwarz, “Raup. Kal.,” i., p., 187 (1791); Rossi, “Fn. Etrus.,” ii., p. 156 (1790); Haw., “Lep. Brit.,” p. 46 (1803); Ill., “Rossi Fn. Etrus.,” ii., p. 247 (1807). [**Hesperia-**] **Ruralis,** Fab., “Ent. Sys.,” iii., pt. i., p. 296 (1793); Panz., “Sch. Icon. Ins.,” p. 41 (1804). **Rusticus,** Hb., “Tent.,” p. 1 (1806); Scudd., “Hist. Sketch,” p. 264 (1875); Tutt, “Reprint Hb's. Tentamen, Ent. Rec.,” xiv., p. 167 (1902); Wheel., “Butts. Switz.,” etc., p. 42 (1903). **Lycaena,** Latr., “Gen. Crust. Ins.,” iv., p. 207 (1809); Oken, “Lehrb.,” ii., p. 720 (1815); Leach, “Edin. Enc.,” ix., pt. i., p. 129 (1815); Ochs., “Die Schmett.,” iv., p. 26 (1816); Sam., “Ent. Comp.,” p. 242 (1819); Koll., “Verz.,” p. 9 (1832); Treits., “Die Schmett.,” x. supp., p. 72 (1834); Freyer, “Neüere Beitr.,” ii., p. 129, pl. clxxv., figs. 1-3 (1836); Bdv., “Gen. et Ind. Meth.,” p. 10 (1840); Neust. and Korn., “Schmett. Schles.,” p. 51, pl. xxiii., figs. 77*a-c* (1842); H.-Sch., “Sys. Bearb.,” i., p. 127 (1843); Evers., “Faun. Volg.-Ural,” p. 56 (1844); Dup., “Cat. Méth.,” p, 32 (1844); Meyer-Dür, “Schmett. Schweiz,” p. 65 (1851); Hdnrch., “Lep. Eur. Cat. Meth.,” p. 14 (1851); Westw. and

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† Probably *icarus*.

Hewits., "Gen. Diurn. Lep.," ii., p. 495 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Wallgrn., "Skand. Dagf.," p. 206 (1853); Gerh., "Mon. Schmett.," p. 13, pl. xxiii., figs. 2*a-c* (1853); Koch, "Schmett. Deutsch.," p. 31 (1856); Speyer, "Geog. Verbr.," i., p. 233 (1858); Ramb., "Cat. Lep. And.," p. 37 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Staud., "Cat.," 1st ed., p. 4 (1861); Rössl., "Lep. Nass.," p. 15 (1866); Snell., "De Vlin.," i., p. 60 (1867); Berce, "Faun. Franc.," i., p. 133 (1867); Nolck., "Lep. Fn. Estl.," i., p. 54 (1868); Newm., "Brit. Butts.," p. 119, fig. 40 (1871); Staud., "Cat.," 2nd ed., p. 10 (1871); Mill., "Cat. Lép. Alpes-Mar.," p. 102 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 110 (1874); Cunì-y-Mart., "Lep. Barc.," p. 20 (1874); Sand, "Lép. Ber. Auv.," p. 6 (1879); Frey, "Lep. Schweiz," p. 14 (1880); Peyerim., "Lép. Als.," p. 23 (1880); Rössl., "Lep. Wiesb.," p. 29 (1881); Schöyen, "Ent. Tids.," iii., pp. 34, 100 (1882); Lang, "Butts. Eur.," p. 103 (1884); Lampa, "Ent. Tids.," vi., p. 13 (1885); Kane, "Eur. Butts.," p. 36 (1885); Auriv., "Nord. Fjär.," p. 12 (1888-91); Brom., "Lep. Riv.," p. 33 (1892); Reut., "Act. F. F. Fenn.," ix., no. 6, p. 12 (1893); Leech, "Butts. China," ii., p. 300 (1893); Rühl, "Pal. Gross-Schmett.," pp. 232, 751 (1892-5); Meyr., "Handbook," etc., p. 348 (1895); Favre, "Lép. Val.," p. 15 (1899); Staud., "Cat.," 3rd ed., p. 77 (1901); Fleck, "Macr.-Lep. Rumän.," p. 19 (1901); Lamb., "Pap. Belg.," p. 221 (1903); South, "Brit. Butts.," p. 158 (1906). **Polyommatus,** (?) [*]Latr., "Consid. Gen.," p. 440 (1810); Godt., "Enc. Méth.," ix., p. 685 (1819); "Pap. Fr.," i., p. 217 (1821); Curt., "Brit. Ent.," v., p. 8 (1824); Stephs., "Illus. Haust.," i., p. 93 (1828); "Ins. Cat.," 1st ed., pt. ii., p. 25 (1829); Bdv., "Eur. Lep. Ind.," p. 11 (1829); Meig., "Eur. Schmett.," ii., p. 31 (1830); Curt., "Cat. Brit. Ins.," p. 174 (1837); Ramb., "Faun. And.," p. 265 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 71 (1839); Westd., "Syn. Gen.," p. 88 (1840); Humph. and Westd., "Brit. Butts.," p. 109 (1841); Dbldy., "Syn. List.," 1st ed., p. 1 (1850); Stephs., "List," 1st ed., p. 20 (1850); 2nd ed., p. 18 (1856); Sta., "Man.," i., p. 61 (1857); Hein., "Schmett. Deutsch.," i., p. 84 (1859); Kirby, "Man.," p. 100 (1862); Rockstr., "Schmett. und Raup.," p. 41 (1869); Kirby, "Eur. Butts.," p. 52 (1882); Buckl., "Larvae," i., p. 112 (1886); Dale, "Hist. Brit. Butts.," p. 79 (1890); Barr., "Lep., Brit. Isl.," i., p. 70 (1893). **Cupido,** [†]Kirby, "Syn. Cat.," i., p. 357 (1871); Auriv., "Bihang Svensk. Vet. Akad. Handl.," v., pp. 25-6 (1880). **Argus,** Latr., "Hist. Nat. Crus.," iii., p. 398 (1802); Bdv., "Icon.," p. 58 (1832); Dup., "Pap. Fr.," supp. i., p. 389 (1832); Zett., "Ins. Lap.," p. 913 (1839). **Lycaeides,** Hb., "Verz.," p. 69 (1816-18); Scud., "Sys. Rev.," p. 33 (1872); Grote, "Schmett. Hild.," p. 41 (1897); "Proc. Sth. Lond. Ent. Soc.," p. 58 (1897). **Zephyrus,** Dalm., "Isis," p. 418 (1824).

Scudder assumes and states (*Historical Sketch*, pp. 93, 252), that *Plebeius* was not used by Linné in a generic sense, and that he only used the name in the plural form. The matter of this statement, already alluded to (*anteà*, p. 150), must be discussed elsewhere, but after giving (*Syst. Nat.*, xth ed., p. 482), the name *Plebeii* to the whole of the "hairstreaks," "blues," "coppers," and "skippers," and subdividing them into (1) *Plebeii rurales* (p. 482), and (2) *Plebeii urbicolae* (p. 484), Linné prefaced his description of every species of these groups with the letters "*P. P.*," writing in full, at the top of each page, the names thus contracted—"Papilio. Plebeius." Each species, therefore, had the singular form applied thereto, *e.g.*, "*P. P. Betulae, P. P. Argus*," etc., so that *Plebeius* was here used quite in the modern generic sense of the division next above the species. In 1764, Müller, in almost similar manner, applies the name generically (*Faun. Insec. Frid.*, p. 37), using *Plebeii* as a group name exactly in the same manner as Linné.

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[*] Probably *icarus*.

[†] Schrank does not mention this species, his *argus* referring to no. 14 (*argyrognomon*) and not to no. 15 (*aegon*) in Schiff., "Verz. Wien.," but the name *Cupido*, to include the "coppers," "blues," and "hairstreaks," originated with him.

but not subdividing it, including also, as did Linné, each species of the "hairstreaks," "blues," "coppers," and "skippers," under the name *Plebeius*, *e.g.*, *Papilio Plebeius Quercûs*, *Pap. Plebeius Argus*, etc. In 1767, Linné (*Syst. Nat.*, xiith ed., p. 787) used the names exactly as in the xth ed., prefacing every species in the *Plebeii*, with the letters, "*P. P.*," *e.g.*, "*P. P. Argus*," etc., so that here again *Plebeius* is used in a modern generic sense, but, in this edition, each page (pp. 787 *et seq.*) is headed "Papilio. Plebius. R.," the "R." (=*Ruralis*) not, however, being applied to the individual species. There can be no question that, in these cases, at least, the name *Plebeius* was applied in the singular form to each individual species in the group. Considering, as we do, that the basis of binomial nomenclature—species and genus—involves the necessity of treating the group directly above the species as a genus, we consider this use of *Plebeius* as essentially generic in the modern sense. This, one suspects, was also Crotch's position (*Cistula Ent.*, i., p. 60) when he says that Linné used *Plebeius* in a generic sense, as also Kirby's (*Syn. Cat.*, p. 653), although Crotch was wrong in stating that Cuvier, in 1799, fixed *argus*, Linn., as the type of *Plebeius*. We are informed by Prout (*in litt.*) that Kluk was the first author to use the name *Plebeius* in its singular form in a generic sense, and that, in 1780, after briefly describing the butterflies in general, he says (*Zwierzt. Hist. Nat.*, iv., p. 81) that they may be grouped in five genera, the last of which is—

Genus v: Plebeius divided into—
Rurales—*Plebeius cupido*, etc.
Urbicolæ—*Plebeius comma*, etc.

which is exactly what Linné did in his *Systema Naturae*, ed. x., pp. 483 *et seq.*, where, having divided *Papilio* into various divisions, of which the *Plebeii* are one, and after subdividing these into the *Rurales* and *Urbicolae*, he calls each individual species in the *Plebeii*—"*P.P.*" *i.e.*, "*Papilio. Plebeius*," the names being placed at the top of every page on which the Plebeiid species are described, whilst no further notice is taken of the plural subdivision names, *Rurales* and *Urbicolae*. Whether we agree that the name, as a group name of modern generic value, had its inception with Linné (*Syst. Nat.*, xth ed.), Müller (*Faun. Friv.*), or Kluk (*Zwierzt. Hist. Nat.*, vol. iv.), certain it is that it was not until 1871, when Kirby used it in his *Syn. Cat.*, app., p. 653, that it again appeared as a genus, nor until Crotch's erroneous indication (*Cist. Ent.*, i., 60) that *argus*, Linn., was, on Cuvier's authority, the type of *Plebeius* as a generic name, and Kirby's definite fixation of the same species as type (*Handbook*, etc., ii., p. 87), that the name attained any modern recognition as a genus. In 1896, we accepted (*Ent. Rec.*, vii., p. 220) *Plebeius*, for the genus of which *argus*, Linn. (= *aegon*, Auct.), is the type, and since then the name has come into pretty general use. Considering that originally the term "genus" and the "generic name" corresponded with our term "superfamily" and the "superfamily name," and that the genera were divided into "families," and that it was not until some 60 years later, between 1817 and 1825, that Latreille entirely reversed the use of genera and families and laid the foundation of our modern system, it appears absurd to allow such an excellent and well-founded old name as *Plebeius* to slip away and be replaced by newer cognomens, whilst *Nymphalis* and others in exactly similar case remain. As we have shown, Linné and others used *Plebeius* exactly in our modern sense, *i.e.*, as a group name next above species, and we feel that time will probably support our contention that it must be so used. In 1804, Latreille gives (*Nouv. Dict. Hist. Nat.*, xxiv., pp. 184-5, 199-200) a series of genera with their respective types, of which one is,—

Genus POLYOMMATUS—*Hesperia argus*—

which, however, has no effect on our work here, since Latreille used *argus* (as did most of the French authors of this and earlier date) for *icarus*. In 1806, however, Hübner published his *Tentamen*, in which he created *Rusticus* with type *argus*, Hb. *nec* Linn. If *argus*, Hb., be considered congeneric with *argus*, Linn. = *aegon*, Hb., *Rusticus* must fall before *Plebeius*, [Linné,] Kluk. About 1818, Hübner founded (*Verz.*, p. 69) the name *Lycaeides* also for *argus* (*argyrognomon*), the type of his genus *Rusticus*, of which it is, therefore, a synonym, and, like the latter, falls before *Plebeius*. Under the name *Lycaeides*, Scudder describes (*Revision*, p. 33) the genus, as follows :—

> Head small; front flat, very slightly tumid beneath, scarcely surpassing the front of the eyes, fully as broad as they, scarcely half as high again as broad; eyes naked; antennæ scarcely longer than the abdomen, composed of about 32 joints, of which the last 12 or 13 form the club; palpi slender, nearly or quite twice as long as the eye. Fore tibiæ a little more than five-eighths the length of the hind tibiæ; middle tibiæ scarcely four-fifths the length of the hind pair; first superior branch of the subcostal nervure of the forewings arising in the middle of the outer two-thirds of the upper border of the cell; the second midway between it and the origin of the first inferior subcostal nervule; cell somewhat more than half as long as the wing.

The Plebeiid egg (*sens. restr.*) is large in size, compared with that of some of its allies, so far as can be judged from the few known and described. Scudder notes it (*Butts. New. Eng.*, ii., p. 961) as white, tiarate, flattened above and below, covered with a delicate tracery of raised lines, having a kind of wheel-pattern; that of *P. scudderii* is described at length (*op. cit.*, p. 966). Of the two very similar European species, both *P. argus* (*aegon*) and *P. argyrognomon* hybernate in the egg-stage (the fully-formed larva coiled up therein till spring). [We believe, however, that *P. lycidas* hybernates as larva.] The eggs of those species that hybernate as larvæ appear to be laid on the leaves and stalks of the plants that provide food, the egg of *P. argus* (*aegon*) is, apparently, not laid on the leaves but on the stems of its more herbaceous food-plants, perhaps not even on the food-plants at all.

The larvæ of *Plebeius* are usually green in colour, modified with yellow, red, and brown longitudinal and oblique markings; and usually responding very markedly to the tints of their foodplant for protective purposes. They are all provided with small, rather pointed heads and long extensile necks (prothorax), which, when young, are inserted into the cellular tissue of the leaf, the soft parts being cleared for some considerable distance from the point of entrance. Scudder describes the larvæ (*op. cit.*, p. 962) of the Nearctic species as green, with or without a dorsal stripe, and with faint and oblique lateral lines, the head capable of being extended to a great length. He further details the feeding habits of *P. scudderii* (*op. cit.*, p. 968) stating that the young larva introduces its head and very flexible and extensible neck, into a small hole, made in the lower cuticle of a leaf of *Lupinus perennis*, devours all the interior of the leaf as far as it can reach, many times the diameter of the hole, so that the leaf looks as if marked with a circular blister having a central nucleus, the nearly colourless membrane of the leaf being all that is left, and, at the central entrance to the blister, the upper membrane only. When older, it feeds on the upper- or under-surface of a leaf, preferring the upper-surface, eating right through the leaf except the skin of the opposite integument, which it does not pierce until nearly full-grown, when Lyman notes (*Can. Ent.*, 1902, p. 127), that it eats the leaf entirely through, making holes sometimes away from, and sometimes at, the edges thereof. This is much the habit of the larvæ of *Plebeius argus* (*aegon*), and *P. argyrognomon*, on their respective foodplants. The larvæ of the genus *Plebeius* appear, in nature, to be almost entirely restricted to leguminous plants for food. Structurally the larvæ appear to be fairly typical of the Lycænids. They are provided of course with the "honey-gland" on the middle of the 7th abdominal segment, and the lateral caruncles or eversible tubes of the 8th abdominal segment, and they have been, perhaps, rather more frequently noted as being attended by ants than any other Lycænid larvæ. Indeed, one of the first extended records of commensalism between ants and these caterpillars was recorded (*Papilio*, iv., pp. 92-93) by Edwards in a western Nearctic species, *Plebeius melissa*. He observes that, on June 9th, 1883, he introduced a small ant to a larva of this species, and then explains, as we have already quoted (*anteà*, vol. viii., p. 32), in detail, how the ant obtains the fluid it sought. The association of the larvæ of *Plebeius argus* (*aegon*) with *Lasius niger* is noted by Aurivillius (*Ent. Tids.*, v., pp. 190, 227), of the larvæ of *P. argyrognomon* with *Formica cinerea* by Thomann (*Beobach. Symb. L. argus*, etc., 1901, pp. 1-40), whilst Powell mentions (*Ent. Rec.*, xviii., p. 214), that he found ants attending the larvæ of *Plebeius argus* (*aegon*), and Chapman notes (*op. cit.*, p. 244) that he found the best way of discovering the larvæ of *P. argyrognomon* (*argus*) was to follow up the ants that were busy with them.

The Plebeiid pupa is very different from that of the Everids. Our detailed description of *P. argus* (*aegon*) pupa (*infrà*) gives the structural characters of the group. Scudder describes (*Butts. New Engl.*, p. 962) the pupa of *P. scudderii*, long and slender, almost uniform green, with a full plump abdomen, covered with a very delicate reticulation of waved lines.

The species of this genus usually show very marked sexual colour dimorphism, the ♂s violet or purplish-blue, the ♀s brown; the spots beneath usually well marked with a well defined orange or yellow band between the marginal and submarginal row of spots. But one of the characteristic features of the underside is the usual presence of highly-developed, metallic-blue, or metallic-green kernels to the marginal spots of the hindwing; a feature also found in other allied groups, but rarely so well or extensively developed as in this. Gynandromorphism appears to be fairly prevalent in *Plebeius argus* (*aegon*), many examples of which we are noting in our account of this species. Rühl records three of these forms in *P. argyrognomon* as follows:—

(*a*) Right side ♂, left ♀; taken near Amboise, at an elevation of 6000 feet (*Pal. Gross-Schmett.*, p. 233).

(*b*) Right side ♂, left forewing ♀, left hindwing brown with two narrow blue streaks, and a little blue dusting at the base and at one point near the border; whole left underside ♀; body ♂; taken near Prague (*op. cit.*, p. 752).

(*c*) A similar specimen, left side ♀, right side ♂, partially only in colouring, but much smaller in size, with much smaller fulvous spots than the left side (*op. cit.*, p. 752).

Another is described by Nickerl thus:—

> (*d*) The left half with the colouring of the ♀, the right with that of the ♂. A bluish stripe extends from the base of the left hindwing towards the hind-margin, so that the wing is divided into two brown patches, the lower of which has also the appearance of being powdered with some bluish scales near the inner margin of the wing (*Lep.-Fn. Böhm.*, p. 19; translated by Müller, *Ent. Mo. Mag.*, iii., p. 114).

We note one in *Plebeius lycidas* as follows:—

> Right side of typical ♂ coloration, left side ♀. The underside shows no variation of ground colour or spots, in fact it is more symmetrical in this respect than many specimens otherwise normal, but there are more blue scales at the bases of the wings on the ♂ side than on the other. The body has not been critically examined but can be seen to be asymmetrical at the apex. The example is in perfect condition and was taken above the 2nd Refuge, on the Simplon Road, July 14th, 1908 (Prideaux).

The actual range of species in this genus has not been determined. The species that appear to fall here are:—"In Europe: *P. argus*, L., *P. argyrognomon*, Bergs., *P. lycidas*, Trapp, *P. zephyrus*, Friv.; in Asia: *P. cleobis*, Brem., *P. tancrei*, Graes., *P. eversmanni*, Staud., *P. lucifera* (*themis*), Staud., *P. eurypilus*, Frr., *P. pylaon*, Fisch., *P. loewii*, Zell., *P. allardii*, Obth., *P. fergana*, Staud., *P. martini*, Allard, *P. staudingeri*, Chrph., *P. christophi*, Staud., *P. insularis*, Leech, *P. barine*, Leech; in N. America: *P. melissa*, Edw., *P. aster*, Edw., *P. scudderii*, Mösch. (perhaps a variety of the preceding), *P. acmon*, Dbldy" (Wheeler).

The group is widely distributed over the north temperate zone of both hemispheres, extending, apparently, from well within the Arctic circle to the southern verge of the Palæarctic and Nearctic regions, one species, *Plebeius argyrognomon*, in the Palæarctic region, extending from Algeria (36° N. lat.) to Finmark (70° N. lat.), and *Plebeius argus* (*aegon*) also extending from northern Scandinavia to southern Spain, Italy, Greece, Asia Minor, etc., whilst in Asia both species occur almost as far south as the Himalayas, and as far east as China, Corea, and Japan, with *P. argus* reaching as far west as Ireland. In the New World, Scudder says (*Butts. New Engl.*, pp. 956-960) that, in the western half of the Nearctic region, it extends into warmer regions than in eastern North America, for, in all, it occurs between 40°N. lat. and 60°N. lat., a region which represents a much colder climate in eastern than in western North America, indeed, in California, it probably descends at least to the thirty-fifth parallel. He adds that, "according to Koch, it is also found in southern Australia, which would accord with its distribution in the northern half of the Old World, or better, with that of the species found in western North America," but one suspects that Koch's record hardly refers to our restricted genus *Plebeius*.

We have already noted (vol. ix., pp. 327-328) the amazing numbers of the males of *Plebeius argyrognomon*, that collect at the runnels and pools of water on the pathways in the Alps of Europe; *P. argus* (*aegon*) is sometimes only less abundant, again all males. Lintner records that the allied *P. scudderii* has similar habits in North America. It collects, he says, in large numbers on damp ground, and he once counted 200 in one spot, and caught 15 with one sweep of the net. We have seen *P. argyrognomon*, so numerous that one might have put the net over 200 without difficulty, and have repeated the operation every ten yards or so for above a mile.

PLEBEIUS ARGUS, Linné (ÆGON, Schiff.)

SYNONYMY.—Species: **Argus,** Linn., "Sys. Nat.," xth ed., p. 483 (1758); "Faun. Suec.," 2nd ed., p. 283 (1761); * (?) Poda, "Mus. Græc.," p. 76 (1761);

EXPLANATION OF PLATE L.

(*To be bound facing Plate L.*)

ANCILLARY APPENDAGES OF SPECIES OF PLEBEIUS.

Fig. 1. Dorsum of *Plebeius argus* (*aegon*) × 30.
,, 2. ,, of *P. argyrognomon* × 30.
,, 3. End of clasp of *P. argyrognomon* × 100.
,, 4. ,, ,, ,, ,, *P. scudderii* × 60.
,, 5. Dorsum of *P. rutilans* × 20.
,, 6. End of clasp of *P. rutilans* × 60.
,, 7. Dorsum of *P. hyrcana* × 20.
,, 8. End of clasp of *P. hyrcana* × 60.
,, 9. Dorsum of *P. pheres* × 20.
,, 10. End of clasp of *P. pheres* × 60.
,, 11. Dorsum of *P. haberhaueri* × 20.
,, 12. End of clasp of *P. haberhaueri* × 60.
,, 13. Dorsum of *P. sieversi* × 20.
,, 14. End of clasp of *P. sieversi* × 60.

N.B.—Note, in comparing, the greater enlargement of Fig. 3, to show the fine teeth, and that Figs. 1 and 2 are enlarged 1½ times more than Figs. 5, 7, 9, 11 and 13.

Plebeius cleobis and *P. eversmanni* are very similar to *P. argyrognomon*. *P. scudderii*, *P. melissa*, and *P. zephyrus* (*lycidas*) have dorsa somewhat like that of *P. argus* (*aegon*), but ends of clasps similar to those of the *P. argyrognomon* group.

No species met with, other than those figured, have the end of the clasps more definitely intermediate between those of *P. argus* and *P. argyrognomon*. All these species (with very various macroscopic characters) are rather intermediate between *P. argus* (*aegon*) and *P. argyrognomon* than outside them, making it difficult to believe that the general similarity of these two species shows close relationship and is not rather due to approach from similar environment or other cause. Except *P. lycidas* they are the only European species of the genus, the only generally distributed species.

Plebeius acmon and some others are apparently outside the limits marked by *P. argus* and *P. argyrognomon*, and there are, it need hardly be said, a few species that there has not been an opportunity of examining.

T.A.C.

PLATE L.

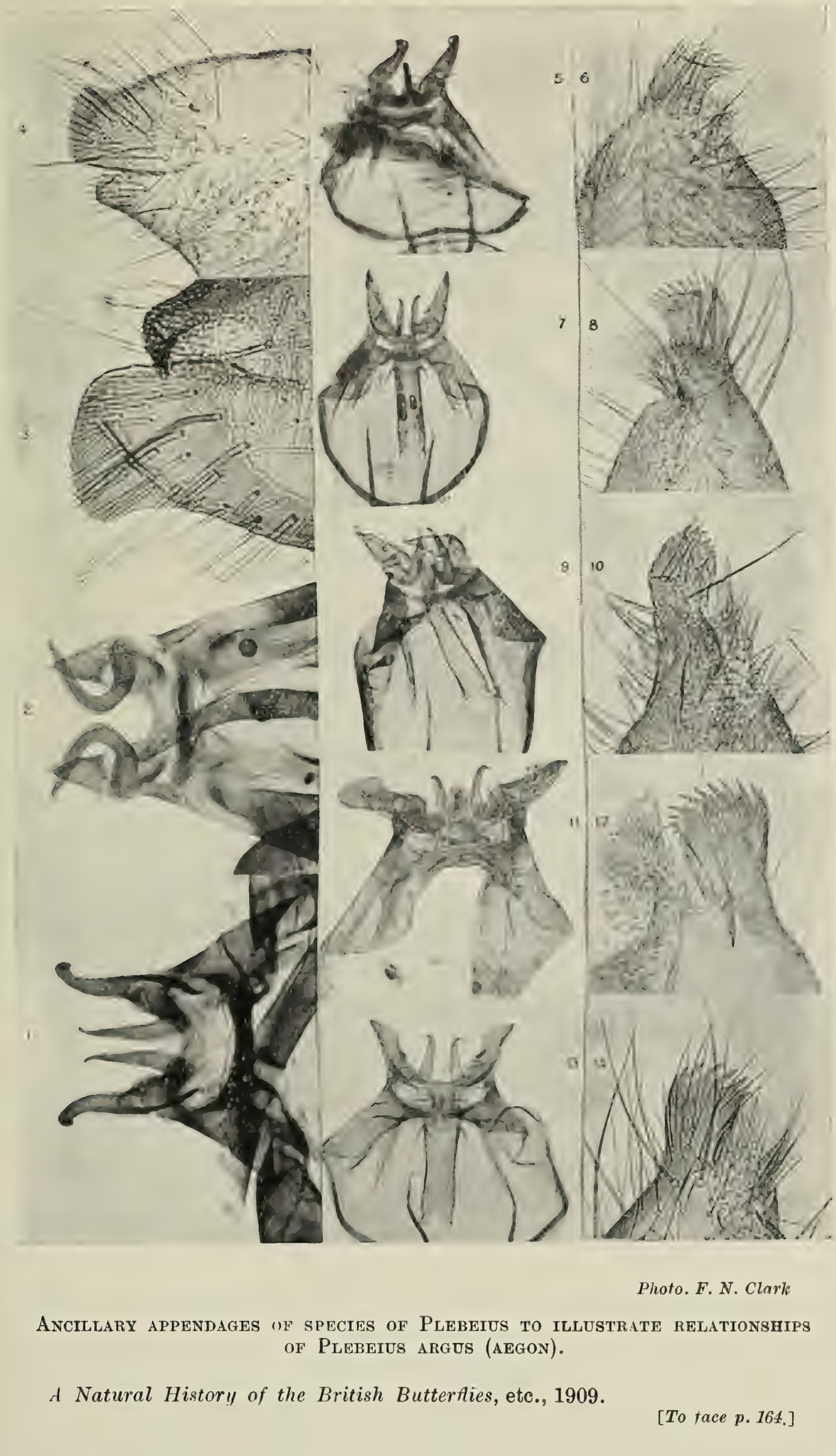

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Photo. F. N. Clark

ANCILLARY APPENDAGES OF SPECIES OF PLEBEIUS TO ILLUSTRATE RELATIONSHIPS OF PLEBEIUS ARGUS (AEGON).

A Natural History of the British Butterflies, etc., 1909.

[*To face p. 164.*]

Scop., "Ent. Carn.," p. 177 (1763); Müll., "Faun. Frid.," p. 36 (1764); * (?) Hufn., "Berl. Mag.," ii., p. 72 (1766); Linn., "Sys. Nat.," 12th ed., i., p. 789 (1767); Fab., "Sys. Ent., p. 525 (1775); Fuess., "Verz.," p. 31 (1775); Müll., "Zool. Dan. Prod.," p. 115 (1776); Kluk, "Zwierzt. Hist. Nat.," iv., p. 90 (1780); Fab., "Spec. Ins.," ii., p. 123 (1781); "Mant. Ins.," ii., p. 74 (1787); De Vill., "Car. Linn. Ent. Fn. Suec.," ii. p. 66 (1789); †Rossi, "Faun. Etrus.," ii., p. 156 (1790); Fab., "Ent. Sys.," iii., pt. i., p. 296 (1793); Pezold, "Scriba's Beitr.," iii., p. 234, pl. xv., figs. 6, 7, larva and pupa (1793); Lewin, "Ins. Gt. Brit.," p. 82, pl. xxxix., figs. 5-7 (1795); Haw., "Lep. Brit.," p. 46 (1803); Panz., "Sch. Icon. Ins.," p. 41 (1804); Ill., "Rossi Fn. Etr.," ii., p. 247 (1807); * (?) Latr., "Consid. Gen.," p. 440 (1810); Leach, "Edin. Enc.," ix., pt. i., p. 129 (1815); Sam., "Ent. Comp.," p. 242 (1819); Dalm., "Isis," p. 419 (1824); Curtis, "Br. Ent.," v., fo. 8 (1824); Stphs., "Illustr. Haust.", i., p. 93 (1828); "Ins. Cat.," 1st ed., p. 11 (1829); Curt., "Cat. Br. Ins.," p. 174 (1837); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 71 (1839); Westd., "Syn. Gen.," p. 88 (1840); Humph. and Westd., "Brit. Butts.," p. 109, pl. xxxiv., figs. 1-6 (1841); Wallgr., "Skand. Dagf.," p. 206 (1853); Kirby, "Syn. Cat.," p. 357 (1871); Scud., "Sys. Rev.," p. 33 (1872); "Hist. Sketch," p. 264 (1875); Auriv. "Bihang. Svenks. Vet. Akad. Handl.," v., pp. 25-6 (1880); Schöyen, "Ent. Tids.," iii., pp. 34, 100 (1882); Lampa, "Ent. Tids.," vi., p. 13 (1885); Auriv., "Nord. Fjär.," p. 12 (1888-91); Reut., "Act. Soc. F. F. Fenn.," ix., no. 6, p. 12 (1893); Kirby, Handbk.," ii., p. 48, pl. xlvi., figs. 4, 5 (1896); Staud., "Cat.," 3rd ed., p. 77 (1901); Wheel., "Butts. Switz.," p. 42 (1903); Tutt, "Ent. Rec.," xviii., p. 132 (1906); South, "Brit. Butts.," p. 158, pl. cv., figs. 1-6 (1906); Tutt, "Ent. Rec.," xxi., p. 58 (1909). ♀ **Idas**, Linn., "Fn. Suec.," 2nd ed., i., p. 284 (1761); Scop., "Ent. Car.," pp. 278-9 (1763); Müll., "Fn. Frid.," p. 36 (1764); Linn., "Sys. Nat.," 12th ed., i., p. 787 (1767); Müll., "Zool. Dan. Prod.," p. 115 (1776); †† De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 67 (1789); ‡Zett., "Ins. Lap.," p. 913 (1839). **Ægon**, Schiff., "Schmett. Wien.," pp. 183, 185 (1775); Göze, "Ent. Beitr.," iii., pt. ii., p. 75 (1780); Schneid., "Sys. Beschr.," p. 252 (1787); Bkh., "Sys. Beschr.," i., p. 154 (1788); ii., p. 225 (1789); Lang, "Verz.," 2nd ed., p. 55 (1789); Schwarz, "Raup. Kal.," i., p. 187 (1791); Bkh., "Rhein. Mag.," i., p. 289 (1793); Hb., "Eur. Schmett.," i., pl. lxiv., figs. 313-315 (1796); "Raup.," i., pl. xxxix., 2*a*, *b* (*circ.* 1800); Ill., "Schmett. Wien.," 2nd ed., ii., p. 72 (1801); Hffmgg., "Ill. Mag.," iii., p. 184 (1803); Laspeyres, "Ill. Mag.," iv., p. 65 (1804); Herbst, "Nat. Sys. Ins.," xi., p. 239, pl. cccxv., figs. 4-6 (1804); Ochs., "Schmett. Sachs.," p. 340 (1805), Hb., "Eur. Schmett.," text, p. 50 (1806); Ochs., "Die Schmett.," i., pt. ii., p. 57 (1808); Oken, "Lehrb.," i., p. 720 (1816); Ochs., "Die Schmett.," iv., p. 26 (1816); Hb., "Verz.," p. 69 (1816-1818); Godt., "Enc. Méth.," ix., p. 685 (1819); "Pap. Fr.," i., p. 217, pl. xi. sec., fig. 4 (1821); Bdv., "Eur. Lep. Ind.," p. 11 (1829); Meig., "Eur. Schmett.," ii., p. 31, pl. xlix., figs. 6*a-e* (1830); Bdv., "Icones," pp. 58, 9 (1832); Koll., "Verz.," p. 9 (1832); Dup., "Pap. Fr.," suppl. i., p. 389 (1832); Treits., "Die Schmett.," suppl. x., p. 72 (1834); Freyer, "Neüere Beitr.," ii., p. 129, pl. clxxv., figs. 1-3 (1836); Bdv., "Gen. et Ind. Meth.," p. 10 (1840); Neust. and Korn., "Schmett. Schles.," p. 51, pl. xxiii., figs. 77*a-c* (1842); H.-Sch., "Sys. Bearb.," i., p. 127 (1843); Evers., "Faun. Volg.-Ural.," p. 56 (1844); Dup., "Cat. Méth.," p. 32 (1844); Dbldy., "Syn. List," 1st ed., p. 1 (1850); Stphs., "List," 1st ed., p. 20 (1850); Nick., "Lep.-Fn. Böhm.," p., 19 (1850); Heydnr., "Lep. Eur. Cat. Meth.," p. 14 (1851); Meyer-Dür, "Schmett. Schweiz," p. 65 (1851); Westd. and Hewits., "Gen. Diurn. Lep.," ii., p. 495 (1852); Led., "Verh. zool.-bot. Gesell.," ii.,p. 20 (1852); Gerh., "Mon. Schmett.," p. 13, pl. xxiii., figs. 2*a-c* (1853); Stphs., "List," 2nd ed., p. 18 (1856); Koch, "Schmett. Deutsch.," p. 31 (1856); Sta., "Man.," i., p. 61 (1857); Speyer, "Geog. Verb.," i., p. 233 (1858); Ramb., "Cat. Lep. And.," p. 37 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Hein., "Schmett. Deutsch.," i., p. 84 (1859); Staud., "Cat.," 1st ed., p. 4 (1861); Kirby, "Man.," p. 100 (1862); Rössl., "Lep. Nass.," p. 15 (1866); Snell., "De Vlind.," i., p. 60 (1867); Berce, "Fn. Franc.," i., p. 133 (1867); Nolck., "Lep. Fn. Estl.," i., p. 54 (1868); Zell., "Stett. Ent. Ztg.," xxx., p. 380 (1869); Rockst., "Schmett. und Raup.," p. 41 (1869); Newm., "Brit. Butts.," p. 119, fig. 40 (1871); Mill., "Cat. Lép. Alpes-Mar.," p. 102 (1872); Bang,

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* Probably *icarus*.

† Includes also *icarus* and *semiargus*.

†† Recognised as ♀ of *argus*. ‡ Includes both sexes.

Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. It.," vi., p. 110 (1874); Cunì-y-Mart., "Lep. Barc.," p. 20 (1874); Sand, "Lép. Ber. Auv.," p. 6 (1879); Frey, "Lep. Schweiz," p. 14 (1880); Rössl., "Lep. Wiesb.," p. 29 (1881); Kirby, "Eur. Butts.," p. 52 (1882); Lang, "Butts. Eur.," p. 103, pl. xxiii., fig. 1 (1884); Lampa, "Ent. Tids.," vi., p. 13 (1885); Kane, "Eur. Butts.," p. 36, pl. iv., fig. 2 (1885); Kill., "Ins. Graüb.," ii., p. 17 (1886); Dale, "Brit. Butts.," p. 79 (1890); Brom., "Lep. Riv.," *p. 33 (1892); Barr., "Lep. Br. Isl.," i., p. 70, pl. xi., 1-1*e* (1893); Leech, "Butts. China," ii., p. 300 (1893); Rühl, "Pal. Gross-Schmett.," pp. 232, 751 (1892-5); Meyr., "Handbk.," p. 348 (1895); Tutt, "Brit. Butts.," p. 182, pl. iii., figs. 6, 7 (1896); Grote, "Schmett. Hild.," p. 41 (1897); "Proc. Sth. Lond. Ent. Soc.," p. 58 (1897); Tutt, "Ent. Rec.," xii., pp. 38, 39 (1900); Fleck, "Macr.-Lep. Rumän.," p. 19 (1901); Lamb., "Pap. Belg.,"* p. 221 (1902). ♀ **Philonome,** Bergs., "Nomen.," ii., p. 72, pl. xliv., fig. 6 (1779); Bkh., "Sys. Beschr.," i., pp. 166, 280 (1788). **Philonomus,** Bergs., "Nomen.," ii., p. 73, pl. xliv., figs. 7, 8 (1779); Göze, "Ent. Beitr.," iii., pt. 2, p. 79 (1780); Bkh., "Sys. Beschr.," i., p. 166 (1788); Herbst, "Nat. Sys. Ins.," xi., p. 258, pl. cccxvi., figs. 11-13 (1804). **Argyrotoxus,** Bergs., "Nomen.," ii., p. 77, pl. xlvii., figs. 3, 4 (1779); Staud., "Cat.," 2nd ed., p. 10 (1871); Peyerim., "Lép. Als.," p. 23 (1880); Favre, "Macr.-Lép. Val.," p. 15 (1899). ♀ **Argyra,** Bergs., "Nomen.," ii., p. 78, pl. xlvii., figs. 5, 6 (1779). ♀ **Argyrophalara,** Bergs., "Nomen.," iii., p. 10, pl. liv., figs. 1, 2 (1779); Göze, "Ent. Beitr.," iii., pt. 2, p. 83 (1780). **Alsus,** Esp., "Schmett. Eur.," i., supp., p. 46, pl. ci. (cont. lvi.), figs. 3, 4 (1782); [Hb., ‡"Beitr.," i., p. 20, pl. iii., figs. 1-3 (1790)]. **Argiades,** Esp., "Schmett. Eur.," i., supp., p. 49, pl. ci. (cont. lvi.), fig. 6 (1782). **Ismenias,**† Hffmgg., "Ill. Mag.," iii., p. 185 (1803). **Ægidion,** Meiss., "Naturw. Anz.," p. 88 (1818); Charp., "Germ. und Zink. Mag.," iv., p. 395 (1821), Meig., "Eur. Schmett.," ii., p. 33 (1830). **Bella,** [Bischoff,] H.-Sch., "Sys. Bearb.," i., p. 127, pl. xlix., supp., figs. 227-8, ♂ (1842); Gerh., "Mon. Schmett.," p. 21, pl. xxxvii., figs. 1*a*, *b* (1853). **Hypochiona,** Ramb., "Cat. Lép. And.," p. 35 (1858).**

The question of which species is the true *argus* of Linné has been a matter that has occupied the ingenuity of entomologists for more than a century. On the strength of Linné's description, quoted *infrà*, and the fact that both *argus* (=*aegon*) and *argyrognomon* (=*argus*) occur commonly in Scandinavia, we should be inclined to consider *argus*, Linn., either a combination of the two, then unseparated, species, or that now known as *argyrognomon*, and, in this respect, should find ourselves in agreement with Schiffermüller, Borkhausen, Ochsenheimer, Zeller, and almost the whole race of European lepidopterists. Schiffermüller (*Sys. Verz.*, p. 183 note), and Borkhausen (*Nat. Eur. Schmett.*, i., p. 294), whom most of the later authors* followed, had, as shown by their writings, a full and clear knowledge of Linné's description of *argus* (and *idas*), and decided it for *argyrognomon*, although Laspeyres (*Ill. Mag.*, iv., p. 65) stated that further evidence was wanted. It happens that, in our examination of the *argus* (=*aegon*) in the British Museum collection labelled "S. Norway," and "Odalen, Norway (Salvin)," and a specimen in our own collection "Saeterstoen (Chapman)," we were struck by the fact that the ♂ s are of the bright "plain" or "lowland" form (in contradistinction to the "heath," "moss," and "mountain" forms), with a rather narrow marginal border to the forewings, and with dots on the hindmargin of the hindwings, rather than a dark border. This might account for the absence of any mention of the marginal border, so conspicuous in some forms, in Linné's description, and, added to the fact that, in the Linnean collection at Burlington House, there are no *argyrognomon* at all, whilst there are seven *aegon* (four, however, evidently added since its arrival in England, and labelled, in Smith's handwriting, as English), one without any label, and the other two without locality data, but labelled, in Linné's handwriting, the ♂ "1074," the ♀ "1075 *idas*," the numbers corresponding with those attached to *argus* and *idas* in the *Fauna Suecica*, 2nd ed., p. 283, and which are possibly the original Linnean types of this insect, suggests caution. This ♂, however, has a rather broad margin. Schöyen writes (*Ent. Tids.*, iii., pp. 33-62 [résumé in French, pp. 100-102], transl. *Ent. Nach.*, viii., pp. 213, 214, 276) an interesting note on the subject of the Linnean *argus*, stating that Wallengren had first (!) referred *argus*, Linné, to *aegon*, Schiff., and that McLachlan had supported this statement by adding that the "typical examples of *P. argus* in the collection of Linné were identical with the *aegon* so common in Britain." On such uncertain ground, therefore, and as the species hitherto known as *aegon*, Schiff., is now generally recognised as *argus*, Linn., we follow the more recently-expressed view of the matter.

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* As var. of *argyrognomon* (*argus*).

‡ The figure appears to be *argyrognomon*, but Hübner, in the text, distinctly contrasts it with the species as given by Esper on pl. xx., which is certainly *argyrognomon*.

† *Ismenias* was the new name given to this species by Hoffmannsegg, in accordance with his plan of renaming every species about whose correct nomenclature any doubt or confusion had arisen. *Ismenias*, Meigen (*Eur. Schmett.*, ii., p. 33, pl. xlix., figs. 5*a-d*), and *ismenias*, Gerhard (*Mon. Schmett.*, p. 13, pl. xxiv., figs. 3*a-d*), are both forms of *argyrognomon*.

** *Leodorus*, Esp., "Schmett. Eur.," i., pt. ii., p. 137, pl. lxxx. (cont. xxx.), figs. 1, 2 (1781), described as a distinct species, is referred to as such by all the following authors:—Schneid., "Sys. Beschr.," p. 253 (1787); Bkh., "Sys. Beschr.," i., p. 156 (1788); Lang, "Verz.," ii., p. 54 (1789); Schwarz, "Raup. Kal.," i., pp. 191, 350 (1791); Herbst, "Nat. Sys. Ins.," xi., p. 248, pl. cccxvi., figs. 1-4 (1804). Meigen (*Eur. Schmett.*, p. 32) gives *leodorus*, Esp., as a variety of "*aegon*," as do Humphreys and Westwood (*British Butterflies*, p. 109). Stephens, in his Catalogue, p. 25, refers both to Esper's figure and to his own "var. δ" in the "Illustrations" (i., p. 94), but the double reference is wholly unintelligible since he gives the following description: "The upper surface of all the wings of a pale, fulvous-tawny, the exact colour of that of *Hipparchia pamphilus*." Herbst's *leodorus*, the uppersides of which are exactly like Esper's (though the undersides are without silver, in spite of his quoting Esper's description), is also given by Herrich-Schäffer (1843), and by Lederer (*Verh. zool.-bot. Gesell.*, ii., p. 20) as a variety of "*aegon*." Ochsenheimer, however, had correctly pointed out that both sexes, so-called by Esper, are ♀ forms of "*argus*" (*argyrognomon*), the one more, the other less, suffused with blue (*Die Schmett.*, i., pt. ii., p. 56, 1808). Gerhard's *leodorus* (see *infrà*) is a form of this species, and was recognised as such by Wallengren. Bergsträsser's pl. cxxi., (figs. 1-3 of which represented "*leodorus*"), though referred to by other authors, seems not to have been published, see Hagen, "Bib. Ent.," ii. *sub nom.* Bergsträsser.

ORIGINAL DESCRIPTION.†—*Argus.* *P. P.* alis ecaudatis cæruleis; posticis subtus limbo ferrugineo ocellis cæruleo-argenteis. ["Fn. Suec.," 803, 804. De Geer, "Ins.," t. 4, f. 14, 15. Wilk., "Pap.,"

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* The early French authors (including Latreille), however, following Ernst and Engr., *Pap. d'Europe*, pl. xxxviii., no. 80, largely applied the name to *icarus*, see also Borkhausen, *Nat. Eur. Schmett.*, i., pp. 275-6.

† The two specimens in the Linnean collection at Burlington House, labelled by Linné, may be described as follows:—"1074. ♂ (*argus*) brightish purple-blue, with rather broad suffused black band, spots of hindwing completely lost in the band; underside hindwing with very white band inside a bright orange lunular band; silver spots not pronounced (underside forewing invisible)." "1075. ♀ (*idas*) unicolorous brown on upperside, not very dark, but with faint indications of orange lunules on hindwing; underside with very white band inside the bright orange lunular band; silvery-blue spots well marked; ground-colour coffee-brown" (Wheeler, April 7th, 1909).

63, t. 1, a 1. Roes., "Ins.," app. 1, t. 37, f. 3-5. Merian, "Eur.," t. 153, 174. Mouff., "Ins.," 106, f. 1. Robert, "Ic.," t. 17. Pet., "Gaz.," t. 35, f. 1. Raj, "Ins.," 131, n. 11, 12. Jonst., "Ins.," t. 6, f. *penult.*] Habitat in *Rhamno* Europæ, Africæ (*Sys. Nat.*, xth ed., p. 483).

Other Linnean descriptions.—No. 1074.—P. P. Argus alis caudatis (*sic!*) cæruleis; posticis subtus limbo ferrugineo; ocellis cæruleo-argenteis. Papilio hexapus; alis rotundatis integerrimis cæruleis; subtus ocellis numerosis. ["Fn. Suec.," 1st ed. 803. Hoffn., "Ins.," i., t. 4. Mouff., "Lat.," p. 105, f. ult. duæ et p. 106, f. 1. Papilio diurnarum minima quarta. Jonst., "Ins.," t. 6, f. penult. Mer., "Pin.," 144. Papilio alis oculatis cyaneum cœlestem spirantibus. Mer., "Europ.," 153. Rob., "Ic.," t. 17. Pet., "Mus.," p. 34, n. 318. Papiliunculus cæruleus, ocellis plurimis subtus eleganter adspersus. "Gaz.," p. 55, t. 35, f. 1. Papiliunculus cæruleus vulgatissimus. Raj, "Ins.," p. 31, n. 11. Papilio parva, alis superne purpureo-cæruleis, subtus cinereis; maculis nigris circulo purpurascente cinctis, punctisque nigris pulchre depictis. De Geer, "Ins.," t. 4, f. 14. 15.] Habitat in *Rhamno*. Descr.—Alæ supra cæruleæ, subtus ocellis numerosis nigris, et in alis secundariis subtus maculis marginalibus fulvis confertis in fasciam pupillis cæruleo-argentatis (*Faun. Suecica*, 2nd ed., p. 283). No. 1075.—P. P. Idas,[†] alis ecaudatis cæruleis,[**] posticis fascia terminali rufa ocellari: subtus pupillis cæruleo-argenteis. Papilio hexapus alis rotundatis integerrimis nigro-fuscis[**]: subtus ocellis numerosis. ["Fn. Suec.," 1st ed., 804, 805. Raj, "Ins.," n. 12.] Habitat in ericetis. Descr.—Facies, magnitudo et color omnino præcedentis a quo differt alarum lateris superioris colore, qui non, ut in illo cæruleus[**], sed omnino nigro-fuscus; alæ secundariæ postice supra fascia obsoleta ex ocellis ferrugineis pupilla nigra. Subtus omnes alæ similes præcedenti, sed pallidiores et fascia albida ante posticam ruffam ex ocellis cæruleo-argenteis. An solo sexu a priori diversus? (*Faun. Suecica*, 2nd ed., p. 284).

No. 232. Argus. P. P. alis ecaudatis cæruleis; posticis subtus limbo ferrugineo; ocellis cæruleo-argenteis. ["Fn. Suec.," 1074. De Geer, "Ins.," t. 4, f. 14, 15. Wilk., "Pap.," 63, t. 1, *a*. 1. Roes., "Ins.," app. 1, t. 37, f. 3, 4. Merian, "Eur.," t. 153, 174. Mouff., "Ins.," 106, f. 1. Hoeffn., "Ins.," 1., t. 4. Robert, "Ic.," t. 17. Pet., "Gaz.," t. 35, f. 1. Raj, "Ins.," 131, n. 11. Jonst., "Ins.," t. 6, f. *penult.* Geoffr., "Paris.," 2, p. 61, n. 30.] *β*. Idas alis ecaudatis cæruleis; posticis fascia terminali rufa ocellari; subtus pupillis cæruleo argenteis. ["Fn. Suec.," 1075. Raj, "Ins.," 131, n. 12. Papilio parvus, alis supinis pullis cum ordine macularum lutearum ad imum marginem. Roes., "Ins.," app. 1, t. 37, f. 6, 7. Geoffr., "Ins.," 2, p. 63, n. 32.] Habitat in *Rhamno* Europæ, Africæ. Femina est *β* (*Sys. Nat.*, xiith ed., pp. 789-790).

[†] This name under no condition can stand for *idas* the ♀ of *argus*, which cannot possibly be the same as no. 192 of the *Sys. Nat.*, xth ed., p. 488, which reads: "*P. B. idas* alis nigris concoloribus punctis 10 flavis, ovalis sparsis. Habitat in Indiis."

[**] These descriptions are contradictory, no doubt "cæruleis" in the first line of this description should be "fuscis," as shown by the context. Borkhausen noticed this *lapsus calami* (*Nat. Europ. Schmett.*, i., p. 274).

Imago.—20mm.-35mm. in wing-expanse. ♂, All wings blue, with a more or less well-defined dark marginal border, the fringes white; ♀ fuscous, with a more or less defined marginal series of orange lunules on the hindwings, sometimes continued on the forewings, the fringes grey. The underside with a discoidal lunule, a transverse submedian elbowed series of dark white-margined spots, a marginal series of dark spots edged internally with yellow lunules, followed by a pale band between these and the discoidal spot, on each wing; on the forewing no spots between the discal lunule and base, on the hindwing one or more spots between discal cell and base. The black marginal spots near the anal angle of hindwing with metallic silver-blue kernels.

Sexual dimorphism.—The coloration of the sexes is entirely different on the upperside, that of the ♂ being blue, with a dark marginal border of varying width to the wings, the fringes white; that of the ♀ deep fuscous-black or fuscous-brown, with or without a marginal series of orange lunules to the hindwings, less often to the forewings, the fringes grey. On the underside the ground colour is also quite different in the sexes, that of the ♂ being distinctly paler than that of the ♀, and in some of the local races showing a very great difference; in the var. *hypochiona* and var. *bejarensis* the colour of the underside of the ♂ is of an extremely white (or bluish-white) tint, that of the ♀s brown, the usual white submedian band being reduced to mere pale lunules on the hindwings. The spots on the underside are usually larger in the ♀ (sometimes much larger), and hence often appear much more crowded and closer to the discoidal spot in both fore- and hindwings; the orange markings on the underside are usually more strongly developed, and the tint more intense in the ♀s than in the ♂s. In almost all the races of this species, the average wing-expanse of the ♂ appears to be greater than that of the ♀, but Rebel notes that, in the Bulgarian race, the ♂s vary from 20mm.-23mm., and the ♀s from 22mm.-25mm. The scaling of the sexes is described (*in litt.*) by Pierce as follows: ♂.—(1) Transparent scales ·0035in. × ·0015in., yellow in colour, plain at apex. (2) Dark scales ·005in. × ·001in., apex with three and four points. (3) Androconia ·0028in. × ·001in., oval in form, the ends being rounded; each with eight rows of nine or ten spots each, connected longitudinally by a line. (4) Underside scales typical, three- or four-pointed at the apex. ♀.—(1) Dark scales, typical, but with five small, even points. (2) Transparent yellow scales present in the blue-tinted ♀s only; these scales are usually plain at the apex, but sometimes three- and occasionally five-lobed. (3) Underside scales of typical form, but with five deeply-emarginate points. ♂ and ♀.—The "silver-studded" scales are transparent, deeply scored with coarse striæ, which cause them to appear pinky-blue; the apex not deeply four-lobed. The androconia are described by Aurivillius (*Bihang till k. Svensk. Vet. Akad. Handl.*, v., no. 25, pp. 25-26) as "tolerably elongated, elliptical,* with eight to nine rows of somewhat large swellings, fairly wide apart; length (without the stalk) 0·054mm. (with it, 0·06mm.), width 0·023mm. The hair-scales are wanting."

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* Aurivillius notes (*op. cit.*) that "the androconia of *P. argyrognomon* are very dissimilar to those of *P. argus* (*aegon*), being almost circular, 0·054mm. in width, with ten to twelve rows of dots thereon; the hair-scales very numerous, particularly in the outer parts of cells one to three; by this character and the formation of the androconia, this species is easily distinguished from *P. argus* (*aegon*). Even with a moderate magnifying-glass the hair-scales may be easily recognised as white hairs."

Gynandromorphs.—There is, without doubt, a considerable number of unrecorded gynandromorphs of this species in various collections, and the following can only be looked upon as a small proportion of the actually existent examples; still, they are the only ones to which we have references:

α. Apparently a brown ♀, but showing on examination under the microscope, a number of ♂ androconia on the left side. There are very few transparent scales, and the other scales are quite typical brown ♂ and ♀ scales; the genitalia are also of ordinary ♀ form (F. N. Pierce, *in litt.*).

β. Right side ♂, left side ♀. Obtained by purchase from Mr. Hodgkins (Gregson, *Ent.*, iii., p. 211).

γ. Right side ♂, left side ♀. Captured July, 1875, at Folkestone (Briggs, *Ent.*, xi., p. 101; *Ent. Mo. Mag.*, xii., p. 166).

δ. Right side ♂, blue, left side ♀, brown; captured in the New Forest in 1890, ♀ side larger than ♂ (*in litt.*, Miss H. Clark). Gynandromorph exhibited at meeting of City of London Ent. Society, April 27th, 1897 (Clark, *Ent.*, xxx., p. 179).

ϵ. Halved. Left side ♂, right side ♀. Taken in the summer of 1892, in the neighbourhood of Stade (*in litt.*, Eggers) (Schultz, *Woch. für Ent.*, ii., p. 364).

ζ. Halved. Left side ♀, right side ♂. The two halves in all respects characteristic of the sexes, including the genital organs. The left wings larger (12mm.) than the right (10mm.). Found on the Albula Pass. In "coll. Wiskott," Breslau (Wiskott, *Lep. Zwitt.*, p. 11).

η. Halved. Left side ♂, right side ♀, in colour and shape. Right wings 12mm., left 10mm. Found in Upper Bavaria. In "coll. Wiskott" (Wiskott, *Lep. Zwitt.*, p. 11, pl. iii., fig. 16).

θ. Left side ♂, right side ♀. Taken July 12th, 1904, near Canterbury (Small, *Ent.*, xxxvii., p. 263).

ι. Right wings ♂, left wings ♀. In the "Dale coll." (Dale, *Hist. Brit. Butts.*, p. 79). A very fine gynandromorphous example, the right side being ♂, and the left side ♀, the sexual differences being equally well-marked on the underside. Labelled from "J. G. Ross' coll. (C.W.D.)." In the "Dale coll.," at Oxford (Walker, *Ent. Mo. Mag.*, xliii., p. 133).

κ. Left side ♂, right side ♀. Not further described (Gillmer, *Ent. Zeits. Guben*, xx., p. 140).

λ. Right side ♂, blue with a broad black margin, the forewing from base to apex 10mm. Left side ♀, unicolorous brown, the forewing from base to apex 13mm.* (Grund, *Int. Ent. Zeits. Gub.*, ii., p. 71).

μ-ξ. Three gynandromorphs in Staudinger's coll. (*in litt.*) (Schultz, *Illus. Zeits. für Ent.*, iii., p. 364). Dadd (*in litt.*) reports on these as follows:

μ. Right side ♂, left side ♀. From Arolsen (*teste* Bang-Haas).

ν. Right side ♀, left side ♂. Locality unknown (*teste* Bang-Haas).

ξ. Right hindwing partially blue-scaled; left forewing partially blue-scaled. From Vienna (*teste* Bang-Haas). [The genitalia of this example should be examined carefully; it may be only a blue-tinted ♀.]

ο. Left side ♂, right side ♀. The ♀ half is larger (forewing 13mm.) and entirely normal above. The specimen being somewhat worn, the markings of the underside appear confusedly through. The ♂ half is smaller (forewing 10·5mm.), blue, with the exception of the wide marginal border which, is black. Here also are seen through the wing, but indistinctly, the markings of the underside, the blue scales being separated and mixed with many brown scales. This circumstance, with others, leads me to assume that, in this example, the ♀ characters dominate, *e.g.*, on the outer margin of the left hindwing (♂ side) between the margin and the blue portion, in four cellules, are well-defined yellow-orange marks as in the ♀, this feature being well-marked on the right side. The fringes are brownish on both sides, darker on the right, especially above, and intermixed with white on the left side, but not of so pure a white as in the typical ♂. The coloration and markings of the underside of both pairs of wings are as in the ♀, perhaps a little less dark on the right than the left, the difference rather arising from the inequality in size. The markings depart from the type in that the two black ocelli near the anal angle of both hindwings are united by a black streak in which they disappear entirely. The markings of the anterior wings differ in that the right has basally, near the lunule, a black dot situated in a white streak starting from the base, a slight trace of this white streak is also seen on the left, whilst in the type the streak and dot are entirely wanting. The antenna of the left side is a little shorter than that of the right. The abdomen appears externally that of a ♀. I am not able to describe the sexual organs, a description that ought to be made. Captured August 6th, 1899, at Wildenhain near Torgau* (Heyne, *Ins. Börse*, 1899, p. 206; *Rev. Mens. Soc. Ent. Namur*, 1901, pp. 23-24).

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* It will be observed in this specimen, and in those marked δ, ζ, η, ο and π, the ♀ side is larger than the ♂, a very remarkable fact, as, in any given locality, the ♂s of this species are usually larger than the ♀s.

There are many undescribed examples in our best British collections. Webb records (*Ent.*, xxi., pp. 133-135) "several gynandromorphous specimens" of this species in his collection, presumably, from the context, all taken "near Dover, in 1887," which is surely of sufficient importance to warrant a more detailed report; with regard to these, Barrett observes (*Brit. Lep.*, i., p. 70) that Webb has gynandromorphous specimens in his collection "some with the right side ♂, others the left (*op. cit.*, pl. xi., fig. 1*b*); and of these, some have dashes of bright blue in the brown of the ♀ side; in one case, the abdomen is furnished with the genital organs of both sexes; these gynandromorphous specimens are further remarkable in that the wings on the ♀ side are larger than those on the ♂, whereas, in perfect ordinary specimens, the ♂ is the larger insect. Similar gynandromorphous examples exist in the collection of C. A. Briggs." It is recorded (*Ent. Rec.*, viii., p. 272) that, when the "Briggs' coll." was sold, several gynandromorphous examples of this species were disposed of at 7s., 6s., 6s., 8s., 8s., and 22s. per pair. Mr. T. Briggs says that these six pairs went into the "Mason," "Maddison," "Booth," "Sheldon," "Maddison," and "Booth" collections respectively. The "Mason" examples have already been disposed of, one of which was bought by Dr. Keynes, who reports on it as follows:

π. Left side typical ♂, 11mm., right side typical ♀, 13mm. Underside on ♀ side with the spots slightly larger, and iridescent spots more apparent.

The "Maddison" examples were recently purchased by Mr. L. W. Newman (for the "Bright coll."), who reports:

(ρ) Right side ♂, left side ♀, "Dover." Possibly this or the next is our example γ (*anteà* p. 170), "Dover" and "Folkestone" being synonymous as a locality for this species.
(σ) Right side ♂, left side ♀, "Dover."
(τ) One with the external sexual colours much mixed up on both sides.
(υ) Not gynandromorphic at all.

Mr. Sheldon writes that the two specimens he bought are merely ♀s with a certain amount of blue coloration, and that amount different on each. Gillmer states (*Soc. Ent.*, xx., p. 131) that the specimen captured June 20th, 1902, by Leonhardt, near Hüningen in Upper Alsace, and described by Schultz (*Berl. Ent. Zeits.*, xlix., p. 81) as gynandromorphous, is merely a blue-tinted ♀. Simimilarly, the ab. *duplex*, Ckll. (described *posteà*), was first recorded as a gynandromorph.

Variation.—The study of the variation of *Plebeius argus* (*aegon*) is of the greatest interest, although it presents considerable difficulty for its intelligible treatment. No species with which we have yet had to deal, has presented a greater number of races, almost all due apparently to local conditions of altitude, latitude, and perhaps some geological and geographical factors of environment. The impress of these conditions is such as to lead us to recognise almost at sight the origin of individuals coming from lowland, highland, heath, and moorland districts, at least in the ♂ s, and not infrequently in the ♀ s. These races are not only, as here indicated, in their broad features fairly recognisable, but each of them presents, within its own racial limits, most interesting aberrational features in the tint of the ground colour, width of the dark marginal band, development of the discoidal lunules, etc., in the upperside of the ♂ s, and in the ground colour, as well as the quantity and intensity of the orange markings on all the wings, of the ♀ ; on the underside the variation is, perhaps, still more marked, the ground colour varying racially from white, through bluish- and greyish-white to greyish-brown in the ♂ s, and pale grey-brown or grey-ochreous to a somewhat deep brown in the ♀ s. The underside spots also vary considerably in size, and somewhat in direction, the orange submarginal band both in intensity and extent, and the beautiful marginal "silver studs," also in number, size, and tint. The variation in size is extreme ; the two largest races, *bejarensis* and *coreana* (inhabiting almost the extreme western and eastern limits of the species), reach 35mm.-36mm., and are difficult to distinguish apart, though quite unlike any other races, whilst the smallest examples of our European mountain form *philonomus*, do not exceed 18mm. Of the general size variation, Chapman notes specimens from Tragacete 30mm., Carinthia 29mm., Locarno 25mm., etc. Blachier gives the average size of specimens from the Geneva district as 24mm. for both sexes, whilst Reverdin gives his largest ♂ as 26mm. (from the Tarentaise), the largest ♀ 23mm. (from Schallberg), the smallest ♂ 20mm. (from Alpienalp), the smallest ♀ 19mm. (from Bérisal); Rehfous notes that, in the Côte d'Or, the size varies from 19mm.-27mm. the average about 22mm. ; Rebel states that the specimens from Sofia and Slivno are small, the ♂ s varying from 20mm.-23mm., the ♀ s from 22mm.-25mm. Wheeler observes that, in Switzerland, the variation in size is very noticeable, increasing up to 32mm. in the hotter localities—Sierre and the Rhone banks at Bouveret producing large examples, and the mountain districts smaller ones, sometimes even less than 23mm. Staudinger reports the ♂ s from the Ala Tau as very large, with broad black band, whilst Romanoff states that the specimens from Kasikoparan are remarkably small. Apart, however, from racial size, the examples of the various plain and mountain forms vary much *inter se*, even in the same locality, and it might be well to look on examples above 27mm. in expanse, as ab. *major*, and less than 23mm., as ab. *minor*. Grund is the only observer who notes a seasonal dimorphism in size. He says that in Croatia (at Agram), the species is very common in the whole district, a first generation in May and June, with a wing-expanse of from 24mm.-29mm., the second, from July to September, from 20mm.-26mm. ; in the second half of August, and sometimes in September, very small specimens 20mm.-21mm., are common, perhaps belonging to a partial third generation. Our British specimens fall into three very distinct races. (1) The chalkhill race, the ♂ s with very narrow dark marginal border to forewings, and spots on hindwings, of fairly large size, and pale underside ; the ♀ s sometimes shaded with blue =

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* Except for the difference in size of the wings on the two sides, which point to a sexual difference, one might suppose from the description that this was another dimorphic ♀ similar to that described *posteà* as ab. *duplex*.

var. *cretaceus*. (2) The heath race rather smaller, the ♂s with fairly well-defined marginal border, the underside distinctly darker; the ♀s scarcely ever shaded with blue=*argus*, Linn.* (3) The moorland form rather smaller than the chalkhill form, the ♂s with narrow marginal borders, the underside pale; the ♀s exceedingly strongly shaded with blue=var. *masseyi*. Throughout these races, there is a considerable amount of variation in the colour-tint of the ♂s. The most common form is a bright purple-blue=ab. *purpurascens*, n. ab., occasionally this is intensified into a brilliant violet-blue=ab. *caeruleus*, n. ab., sometimes it is weakened off into a lilac or lavender-blue=ab. *lilacina*, n. ab., and in its extreme form to a lilac that is almost pinkish in tone=ab. *pallida*, n. ab. We have such a form from Dover, and Prideaux another from Bérisal, and Barrett notes that, in the "Webb coll.," is a ♂ of a pale lavender colour, and others with white dashes extending from the borders. Walker notes a "small, pale lavender-blue ♂ from Dover," in the "Dale coll." Dwarf ♂ specimens appear always to develop a pale lavender ground colour. Our tiniest example 18·5mm. from "Pontresina, July 10th, 1904," is of the palest lilac tint; very similar specimens in the British Museum coll., are labelled "Lapland, Leech coll.," a ♂ (19·5mm.) and ♀ (22mm.), the former with good border and discoidal lunules; the orange lunules on hindwings of ♀ fairly-developed, on forewings almost absent. Two other little lavender ♂s (20mm. and 24mm.), but with narrower border, and two almost similar small ♀s (22·5mm. and 23mm.), but with a little more orange, are ticketed "Roman Campagna, 3. ix. '44, Zell. coll." One suspects a similar cause for the likeness in all these, *viz.*, a short larval life on innutritious food, that from Pontresina being badly placed, those from Lapland, owing to the short summer and limited feeding-period, the Italian examples through having to feed up on parched food in the August heat, having hatched at the wrong period of the year. These tiny examples, of 21mm. or less, we call ab. *minutissimus*, n. ab. Cox notes that, in mid-June, 1868, the species occurred near Tunbridge in thousands, and one specimen captured measured only 18mm., the spots on the underside being very faint, and reminding one somewhat of those of *Cupido minimus*. Usually, very small specimens have the underside spots well-developed; in this respect they do not fail. As showing the difference in average size of the British races, we note that Buckstone exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1899, p. 109) a comparative series of specimens from Oxshott, on gravel soil, and another series from near Sevenoaks, on chalk soil, those from the chalk averaging very much larger than those from gravel. As between the imagines of the great plain of Central Europe, and the Alps, a distinct difference is observable; those from the plains are larger, brighter, bluer (more violet), with narrow margin to forewings, and spotted hindwings, and with rather pale undersides, and very similar whether from the hotter valleys of Switzerland, the plains of central Europe, or the lowlands of southern Scandinavia, no doubt the form *aegiades*; those from the Alps are of deeper, more purplish, blue, often approaching the lilacine form, the dark margins of all the wings well-developed, the dark shading prolonged interiorly along the nervures in the form of rays, the discoidal lunules generally distinct on the upperside of all the wings, whilst, on the underside, they are rather grey, or even grey-brown, than whitish- or bluish-grey; and they are usually distinctly smaller. These are of the *philonomus* form. Of these differences Reverdin notes (*in litt.*) that, on placing ♂ s of the "alpine" and "plain" races side by side, the brighter tint of the latter is apparent, whilst the former are usually smaller, and the black margins wider and more diffuse. In the British Museum collection, well-defined examples of the bright "plain" form are labelled "Odalen," "Kreuznach," "Rennes," "Bourg d'Oisans," "Tyrol" (evidently a valley specimen), "Zürich," etc. Hormuzaki notes (*Soc. Ent.*, viii., p. 18) that the ♂ s of this species are particularly fine throughout the Bucovina, but near Czernowitz are especially so, being fully 30mm. in expanse; the brownish-black border is very broad, 3mm.-4mm., on the inner edge gradually blending with the ground colour, the white fringes also being extremely broad. The Bulgarian examples in the British Museum coll., are also of good size, with well-developed marginal border in the ♂ s, and noticeable discoidal spots. As illustrating the change that occurs as a matter of altitude in the same district, one may note that the ♂ s from Bourg d'Oisans are markedly of the "plain" form, those from Oulx have a well-marked marginal border, those from the Col du Lautaret a much wider border and distinct discoidal spots, and markedly of the "mountain" form. Zeller states (*Stett. Ent. Ztg.*, 1872, p. 37) that the ♂ s from Bergün agree on the upperside with those from Posen, even the nervures being scarcely darker; Gillmer notes (*in litt.*) that the ♂ in Anhalt is small, dark blue in colour, with a fairly broad, dark margin. A ♂, in the British Museum coll., taken in Portugal, June 8th, 1880, is of a blue-grey or slaty-grey colour, with rather narrow marginal border, and very small discoidals on forewings = ab. *plumbeus*, n. ab. The width of the marginal border in the ♂ varies exceedingly. As already noted, our own British chalkhill race has hardly any marginal border to the forewings, and its place is occupied on the hindwings by marginal dots. These dots on the hindwing are sometimes particularly well-developed = ab. *marginipuncta*, n. ab. The variation in the width of the marginal borders is noticeable in almost all the races. *e.g.*, some of the mountain forms have very wide borders, extending far along the nervures towards the bases of the wings; this is particularly so on the southern slopes of the Alps at moderate elevations, *e.g.*, Piotta, Brugnasco, etc. They are also larger in size than the usual mountain examples. Otherwise they are of the general colour, appearance, etc., of the *philonomus* form, and have been named *killiasi*, Christ. There are, therefore, to be considered in almost every race, examples with narrow marginal borders = ab. *angusta-marginata*, n. ab.; those with moderate borders, *e.g.*, up to one-fourth of the wing expanse = ab. *intermedia-marginata*, n. ab., and those with wide borders, *e.g.*, more than one-fourth the width of the wing = ab. *lata-marginata*, n. ab. The examples from Ticino are particularly-well-margined, and Blachier notes two ♂ s from Istria, as well as a ♂ from Armenia, that have particularly wide borders, the black colour prolonged along the nervures, and closely resembling the widest-margined Simplon specimens. The extreme form in this direction appears to be ab. *obscura*, Grund. In most of the examples in which the marginal border to the forewings is particularly narrow, that on the hindwing is reduced to a series of interneural spots. Blachier notes (*in litt.*) that certain ♂ s from near Geneva show an antemarginal row of very large black dots on the upperside of the hindwings; these spring from the black line that precedes the fringe, some examples having as many as five dots; they are also present in the alpine examples, but absorbed in the wide black border. Rebel states that the specimens from Sofia and Slivno have narrower black borders to the forewings, and clearly-displayed black marginal spots, on the hindwings, showing, he says, in this respect, a transition to the var. *bella*, H.-Sch., of Asia Minor, the general colouring, especially of the underside, otherwise resembling that of Central European examples; Rebel, of course, is here using *bella* erroneously for our *orientalis*. Lowe notes the ♂ s taken in early May on the Sacro Monte as being rich in colour, very deeply bordered with black, throwing into relief the white fringes; the undersides with the base well-powdered with blue. In British specimens there is also considerable difference, the marginal borders of var. *cretaceus* being sometimes practically obsolete, even on the forewings, and a trace of pale greyish spots occupying its position. Fowler states that, at Wimborne, the ♂ s vary from deep purple to light blue, and that one ♂, taken in 1888, had dark iridescent blotches upon the centre of the upperside of the forewings. Occasionally the ♂ s with spotted borders to the hindwings have a tinge of fulvous above the spots. This is, of course, the special feature of var. *bella*, H.-Sch., an aberration of var. *orientalis*, but it is a form of variation that is particularly widely distributed, *e.g.*, Hodgson is reported (*Proc. Sth. Lond. Ent. Soc.*, 1907, p. 89) as exhibiting a ♂ from North Lancashire with the orange scaling on the upperside of the hindwings in the same position as in that of the normal ♀ s. He informs us (*in litt.*) that he has three ♂ s from North Lancashire so tinged, two with two spots, and one with one spot, all symmetrical in both hindwings; also that Grosvenor had a similar orange-scaled ♂ from Surrey. Reverdin notes (*in litt.*) the capture of a male at Schallberg, on July 8th, 1907, which has very distinct tawny lunules on the upperside of the hindwings, and which he has named *rufolunulata*, in the *Bull. Soc. Lep. Genève*, to be shortly published. It appears, unfortunately, to be a synonym of *bella*, H.-Sch. He also notes two other ♂ s from the Alps, in which these lunules are to be detected with a lens, and says that Oberthür has also found ♂ *argus* with similar tawny lunules in the Pyrénées-Orientales, but it appears to be particularly well-developed in some of the Spanish races. It is an especial feature of some of the specimens of the var. *casaicus* (from Casayo), described and figured by Chapman (*Trans. Ent. Soc. Lond.*, 1907, p. 158, pl. v., figs. 16-17), and we find it present also in specimens of *hypochiona* (from Canales), *brañuelasensis* (from Brañuelas) and *vigensis* (from Vigo) (see *infrà*). According to Lampa (*Ent. Tids.*, vi., p. 13), specimens showing this peculiarity are found in Scandinavia, Finland, and Denmark, but one suspects that Lampa is not referring here to true *bella*, but merely to the spotted hindwing form, although he mentions the characteristic red lunules on the upperside of the hindwing. There is considerable difference in the development of the discoidal spots on the upperside of the ♂ s. Those with none might be termed ab. *disco-obsoleta*, n. ab., those with them only on the forewings *disco-anteriora*, n. ab., with them only on the hindwings *disco-posteriora*, n. ab., on all the wings *disco-lunulata*, n. ab. Although occurring almost everywhere aberrationally, there is no doubt that those from the plains of Europe (including our chalkhill form) are usually without them, whilst those of the mountains possess them, *e.g.*, the specimens of the Geneva district rarely have them, whilst the alpine ♂ s of Savoy and Switzerland have them clearly marked; examples from Bourg d'Oisans are without them, those from the Col du Lautaret, high up the same valley, possess them strongly marked. They are strongly developed in examples from Trafoi, Preth, etc., and occur in the Japanese form, *pseudaegon*, etc. St. Petersburg examples, otherwise almost like our British chalkhill form, have the lunules showing, which ours have not. The variation in this direction is, however, easily traced. The race with the most marked discoidal lunules of which we have knowledge, is our Asiatic var. *ongodai*. The ground colour of the underside of the ♂ varies exceedingly, and has a distinct racial tendency. It exists from almost pure white, through every tint of bluish-white, whitish-grey, weak coffee-brown, and reddish-grey, but usually with distinctly more variation than in the allied *P. argyrognomon*, which is generally particularly uniform in the tint of its ground-colour. Usually the white, bluish-white, and paler ground colours, are characteristic of races inhabiting exposed open areas; the greyer ground colours of less exposed areas, or of high altitudes and latitudes, whilst the browner are particularly characteristic of heathy localities on deep red sand or dark gravel soils, the darkest coloured undersides that we know belonging to the specimens haunting the heaths of Fontainebleau Forest, where also the ground colour of the underside of the allied *P. argyrognomon* is even still more marked, and in the same direction (especially in the second brood), indeed, the colour is darker than in some ♀ s from other localities. This underside colour-variation, is mentioned by Oberthür, who, after noting the whiteness of that of *hypochiona*, remarks (*Etudes*, xx., p. 28) that, in Brittany and in England, the underside of the wings in the ♂ is no longer snow-white, but bluish-grey. Blachier says that the ♂ specimens from Digne (June), and certain examples from Vernet-les-Bains (July), are of a very clear bluish-white colour beneath, sometimes almost as white as the true *hypochiona* of Andalusia. The undersides of the ♂ Bulgarian specimens are whitish-grey, very like our chalkhill form in this respect, as also are those from the St. Petersburg; the specimens from Kreuznach are, perhaps, a shade whiter, as also those from Bourg d'Oisans, but those from the Col du Lautaret, a few miles further up the Romanche valley, but 4000ft. higher, are distinctly darker grey, *i.e.*, of the mountain form. Of the Pyrenean examples in the Brit. Museum coll., those from Gavarnie and Vernet, have the underside very bluish-white, but those from the Lac d'Oo are less bluish and rather greyish-white in tint. We have dealt with the Gavarnie examples (*infrà*) as vars. *pyrenaica* and *hypochionoides*. Reverdin notes (*in litt.*) that the underside of the posterior wings of a ♂ from Divonne appears to him remarkable in having a pale ground colour, and particularly prominent white submedian band; in Swiss examples, he says, the ground tint is more or less dirty grey, and the white band less apparent; whilst Gillmer states that, in Anhalt, the underside of the ♂ s vary from ashy- to bluish-white, with a white band between the submedian row of spots and the margin of the hindwings. Frey records specimens from the Valais with greyish-brown underside, and very small ocellated spots. We have, however, dealt somewhat at length with the particular coloration of the underside in our notes on the various local races. The colour of the spots beneath is usually black, with pale rings, but in those with white ground colour the rings are of course obliterated. In the var. *corsica*, however, the spots are mere areas of the pallid, washed-out ground colour, surrounded by white rings. The number of spots in the submedian row of the forewings is seven, of the hindwings nine, of which six and seven in forewings, and seven and eight in the hindwings are more or less united; very rarely a minute dot appears quite on the costa of the forewings, thus making the double dot seven and eight in both fore- and hindwings. Apart from this extra dot, the most frequent absentees are seven, or six and seven in the forewings. There is very occasionally a spot between the discoidal and base of forewing = ab. *unipuncta*, whilst between the discoidal and base of hindwing there may be four, three, two, one, or none, the usual numbers being three or two, four, so far, having been found only in the ♀ s; the longest to stay in this basal row is the upper (costal) one, which, perhaps, really belongs to the submarginal series. There is a distinct bend in the submarginal row on the forewings at the fifth spot, the fifth, sixth, and seventh sometimes shifting their position so far as to come directly under, and form a straight line of dots with, the discoidal, reaching to the inner margin (ab. *linea*), very striking and conspicuous in two examples from Bourg St. Maurice, but also present in others. The spots vary much in size, sometimes being exceedingly small (= ab. *parvipuncta*, n. ab.), more often, however, exceptionally large, and sometimes slightly extended (= ab. *magnipuncta*, n. ab.), *e.g.*, Blachier notes (*in litt.*) two ♂ s (one from Binn, in Valais, the other from le Lavandou, Var) in which all the ocellated spots are extremely developed, and all of the same large size; Turner also records (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 42) a ♂ from Ashdown Forest with specially large spots on the underside. Some have unequal and irregularly-formed dots, three and five being usually the more extended (= ab. *irregularis*, n. ab.). Blachier notes (*in litt.*) that he took on June 6th, 1906, near Geneva, a ♂ with the second, third, fourth, and fifth of the submedian row of spots on the underside of the forewings, prolonged inwards in the form of streaks (ab. *anticoradiata*, n. ab.), the hindwing spotting being normal; Turner also records (*Proc. South Lond. Ent. Soc.*, 1895, p. 42) a similar aberration. Curtis, many years ago, noted (*Brit. Ent.*, fo. 8) the variation in the size of the spots, and their occasional development into oval blotches; the elongation, however, is often irregular, and the spots are occasionally extended upwards rather than lengthwise, whilst the tendency is less frequent in the ♀ than in the ♂. Raynor notes (*in litt.*), a ♀, taken in Abbotts Wood, which has three horizontal wedge-shaped streaks replacing the third, fourth, and fifth spots in the transverse series of six spots, parallel with the outer margin of the underside of the forewings. Zeller records (*Stett. Ent. Ztg.*, 1872, p. 37) two ♂s from Bergün with specially small dots. Walker notes (*Ent. Mo. Mag.*, xliii., p. 134) a ♂, very pale beneath, with all the markings obsolescent, in the "Dale coll." He writes (*in litt.*) that "all the ocellated spots on the underside are present, but the black centres much reduced in size (not more than half normal), pale in tint, and the white rings much reduced. In the forewings the submarginal spots are quite evanescent . . . . and on the hindwings there is no trace whatever of the usual metallic-blue scales in these spots." In his group of elongate forms, "Formæ elongatæ," Courvoisier notes (*Mitt. Schweiz. Ent. Gesell.*, xi., p. 20) two ♂s and one ♀, *P. argus*, with some of the ocellated spots of the curved discal row elongated in a direction parallel with the nervures. The most extreme forms of this kind appear to be ab. *maritimus*, Stphs. (ab. *radiata*, Obth.), and ab. *juncta*, n. ab. In both, a series of extended lineations runs parallel with the hind-margin of both wings; in the former, the lineations are largely cuneiform and mere extensions of the normal dots of the submedian row, whilst in the latter, the lineations are made by the union of the dots of the submedian row with the corresponding black interneural lunules that edge the orange lunules internally. A magnificent specimen of this latter aberration is in the British Museum coll. Still another form of radiate development occurs, *viz.*, that in which the submedian row of spots is entirely absent, but the black internal lunules themselves form, on all the wings, a series of cuneiform spots pointing towards the base = ab. *cuneata*, n. ab. The only example of this form that we have seen was taken by Mrs. Prideaux at Bérisal. Krodel has described and figured (*Allg. Zeits. f. Ent.*, ix., p. 53, fig. 20) a ♂ in which the underside of the hindwings shows the confluence of the black lunules edging the orange marginal lunules, with the corresponding spots of the submedian row (as in *juncta*), whilst on the forewings the ocellated spots of the submedian row are quite absent (= ab. *obsoleta-juncta*, n. ab.) [Krodel's reference (*op. cit.*) of H.-Schäffer's fig. 247, to this species, is erroneous; it is evidently an example of *argyrognomon* as the author says.] Sometimes the spots are united so as to form a transverse band, *e.g.*, Bayne records a specimen from the New Forest with spots on hindwings coalescing so as to form a short band. Moore also notes an example from Oxshott with confluent spots on the underside. Aigner-Abafi describes and figures (*Ann. Mus. Nat. Hungarici*, 1906, p. 515, pl. xiv., fig. 6) an aberration with spots two to six of the submedian row united into a transverse band on the forewings, whilst on the hindwings the spots of the same row are similarly united, with the additional union of the costal spots (= *costajuncta*), and similarly the basal spots (= *basijuncta*): the specimen is a ♀, 24mm. in expanse, captured at Budapest in 1891. It is such a poor specimen, however, that the junction of all these spots fails to produce a striking effect. Prideaux has an almost identical ♀ captured at Bérisal. Other forms characterised by united spots are mentioned by Courvoisier (*op. cit.*, p. 20) in his "formæ confluentes," *viz.*, (1) The confluence of the first basal spot and the upper spot of the submedian row on hindwings into an ⊢-like mark = ab. *costajuncta*, n. ab. (2) The confluence of the penultimate spot of the submedian row of the hindwings, and the penultimate basal spot = ab. *basijuncta*, n. ab. (3) The confluence of the central lunule of the forewings with the spot (or spots) directly opposite in the sudmedian row = ab. *mediojuncta*, n. ab. We have an excellent example of the form *costajuncta*, captured at Clelles, July 29th, 1906, and Turner records one taken at Ashdown Forest (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 42), whilst Adkin mentions a similar one taken at Oxshott (*Ent. Rec.*, v., p. 279), and Oberthür figures (*Etudes*, xx., pl. iv., fig. 61) a ♀ of the same form from Vernet-les-Bains. The development of extra basal spots would come within the limits of Courvoisier's "Formæ luxuriantes," as also would the form in which extra dots occur between the discoidal lunule and submedian row, or on either side of the normal spots of the latter = ab. *addenda*, n. ab. Sometimes some of the normal spots are absent, and the others are smaller than usual (= ab. *caeca*, Grund), whilst occasionally, all the spots of the submedian row on both wings are absent (= ab. *extrema*, n. ab.), *e.g.*, Blachier notes (*in litt.*) that he captured at Digne a ♂ with only the discoidal lunules and the submarginal orange-mounted chevrons left, all the spots of the submedian row being absent; he further notes a ♂, taken July 7th, 1908, at Dazio Grande, without ocellated spots below, the places of four dots being indicated merely by a small round whitish spot. Of the *obsoleta* forms, Reverdin notes (*in litt.*) four ♂s in which spots six and seven of the forewings are absent. He also notes a ♀ that has a supernumerary spot on the forewings in front of spot 1; this example also presents a lengthening of the spot in cellule 2, and an union of the two spots of cellule 1*b*, the two united spots being converted into an oblique streak "*arrière et en dehors*" diverging at a sharp angle from the streak in cellule 2; in the same specimen in the hindwings the two points of cellule 1*b* are joined in the form of a streak, and the point of cellule 1*a* is elongated a little, almost in the form of a comma; these two streaks (in cellules 1*a* and 1*b*) are both directed towards the base of the wing. Chapman exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1907, p. 73) a specimen in which the spots of the underside of the hindwing are particularly well-marked, making almost a ring round the discal spot. The modification of the discoidal spots on the underside of the wings, is of rare occurrence; sometimes, however, they are absent in the forewings = ab. *anticoimpunctata*, n. ab., sometimes absent on the hindwings = ab. *posteroimpunctata*, n. ab.; sometimes absent on all wings = ab. *impunctata*, n. ab. The strangest form is one in Prideaux's coll., with each of the discoidal spots, beneath, heart-shaped = ab. *cordata*, n. ab. There is considerable variation in the tint of the orange on the underside. Sometimes the tint is distinctly red (*rufescens*, n. ab.), at other times quite pale yellow (*flavescens*, n. ab.), with almost every intermediate shade. The orange is rarely absent on the hindwings, but frequently fails on the forewings. In the ♀s the tint is usually deeper and more pronounced than in the ♂s, and is, particularly, much more strongly developed on the forewings. Zeller says that, at Bergün, the ♂s have no red band on the forewings, although the ♀s have this band well-developed; Lowe notes that, in the ♂ specimens taken on the Sacro Monte, in Piedmont, the red band is very broad and distinct on the hindwings, yet never continued on the forewings, even faintly, its place on these wings being occupied by a smoky suffusion. Individuals are occasionally met without traces of the metallic kernels to the marginal spots of the underside of the hindwings = ab. *leodorus*, Gerhard. This failure is much more frequent in the ♂ s than in the ♀ s; indeed, in some races, *e.g.*, *bejarensis*, in Spain, and *coreana*, in Korea, the ♂ s are specially noted in the original descriptions as largely failing in this particular, whilst, in the Japanese races, they often entirely fail in the ♂ s, although present in the ♀ s. Rehfous observes (*in litt.*) that, in the Côte d'Or, the development of these spots is very irregular, examples occasionally having none, but sometimes the number reaches six, the ♀ s being more often richly endowed than the ♂ s in this respect; whilst the mountain examples usually have fewer than the typical form. Two or three metallic kernels are the more usual numbers, four not infrequent, but five or six rare = ab. *argyrotoxus*, Bergs. Rothke notes that specimens of the *leodorus*, Gerh., form are occasionally found in the Krefeld district, and the absence of metallic spots is one of the characters specially noted in the original description of *aegidion*, Meissner. Hormuzaki also observes that, in many examples found in the Czernowitz district, the black marginal spots on the underside of the hindwings do not show a trace of the metallic blue centres. Similarly, the specimens from Bilbao are noted as being almost without metallic spots on the underside. Morrison notes (*Ent. Wk. Int.*, vii., p. 165) that one of the few rare Scottish examples known, taken about three miles north of the Pass of Killiecrankie, in 1858, had the metallic spots on the underside larger and more lustrous than in more southern specimens. Gillmer says that, in Anhalt, there are usually two or three metallic spots, sometimes, however, only one, and occasionally as many as four; specimens without any silver spots have not been observed in Anhalt. The ♀ varies quite as much as the ♂. The fuscous ground colour may be quite of a pale brownish hue, or it may be dark, inclining to black. The black marginal spots may be almost lost in the ground colour, or they may be clearly defined with internal marginal lunules of orange or yellow, and an external edging of white. The normally orange portion may be entirely absent or merely indicated in pale grey, or may be well-developed as separate lunules of a yellow or bright orange, or the latter may be united into a continuous band on the hindwings, or on all the wings. The bases of the hindwings alone, or of all the wings, may be tinged with light blue or violet scales, or these may spread over the discal area and cover the greater part of the wing, in the most extreme forms reaching the outer marginal spots, and forming an exactly parallel variation to that seen in *Agriades coridon* (ab. *syngrapha*), *A. thetis* (*bellargus*) (ab. *ceronus*), and *Polyommatus icarus* (ab. *clara*), whilst, as in the latter, pale, cuneiform marks may rest as it were on the marginal spots, and point towards the centre of the wing. In almost all cases, the variation is more marked on the hind- than on the fore-wings. The different aberrational forms in some districts become racial or varietal in others, and the union of two or three or more aberrational characters in the same individual makes them difficult to describe. The following is an attempt to deal with some of the complications:—

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* There is much to be said for considering this the Linnean type form, since (1) the ♂ specimen in the Linnean collection carrying Linne's own label is of this form (see *anteà*, p. 167), and (2) the ♀ which Linné labelled and described as "*idas*" (*Fn. Suec.*, 2nd ed., p. 284), appears also to belong here; this is supported by the fact that in his description of *idas* (see *anteà*, p. 168) Linné adds "Habitat in ericetis," thus settling the fact that his ♀, at any rate, was taken "on heaths," as the ♂ certainly appears to have been.

1.—Uniformly fuscous = ab. *fuscus*, n. ab.
1*a*.—Fuscous, the hindwings scaled with blue = ab. *posterocaerulescens*, n. ab.
1*b*.—Fuscous, all the wings scaled with blue = ab. *caerulescens*, n. ab.

2.—Fuscous, with orange lunules on hindwings = ab. *posterocroceus*, n. ab.
2*a*.—Fuscous, with orange lunules on all wings = ab. *croceolunulatus*, n. ab.
2*b*.—As in 2, but scaled with blue = ab. *croceopostcaerulescens*, n. ab.
2*c*.—As in 2*a*, but scaled with blue = ab. *croceocaerulescens*, n. ab.
3.—Fuscous, with orange band on hindwings = ab. *croceosemivirgatus*, n. ab.
3*a*.—Fuscous, with orange band on all wings = ab. *croceovirgatus*, n. ab.
3*b*.—As in 3, but scaled with blue = ab. *croceosemivirgatus-caerulescens*, n. ab.
3*c*.—As in 3*a*, but scaled with blue = ab. *croceovirgatus-caerulescens*, n. ab.
4-4*c*.—As in 2-2*c*, but with yellow instead of orange { substitute *flavus* for
5-5*c*.—As in 3-3*c*, but with yellow instead of orange { *croceus* throughout.

The whole series might be gone through again to satisfy the darker, almost blackish, race, substituting *nigrescens* for *fuscus*, as there are two very distinct shades of ground colour in this sex; in addition, almost all the above forms occasionally have a white external edging to the marginal spots = *albomarginatus*, or even a blue edging = *caeruleomarginatus* (the *argyra*, Bergstr., is a special form of this), whilst yet again there are two very distinct shades of blue with which the ♀s are scaled (1) bright (but somewhat pale) blue = *caerulescens*, (2) a deeper, more violet-blue = ab. *violascens*, and these again, are applicable to all the blue forms described above. The shading of the upperside of the ♀ with blue scales is very interesting, and produces some very remarkable and pretty aberrations. The hindwings appear to be most susceptible to this form of aberration, but it extends frequently also to the forewings. In some cases this is racial, as in our British moorland form, var. *masseyi*, and in var. *corsica;* in others it is quite aberrational, but, in all cases, the arrangement of the blue scales appears to follow similar lines, beginning with thinly-scaled, wedge-shaped, interneural areas, the bases of the wedges on the fulvous marginal lunules of the hindwing, the apices at the disc, a similar thin scaling extending from the base towards the disc, the disc and costa being at first freest from blue scales, but the area extending until the whole wing is covered, except the margin and costa; in the forewing a similar, but much less marked development takes place, the disc remaining clear usually long after the hindwing is quite covered with blue scales. Oberthür states that, in England, the ♀ has often traces of blue on the deep brown ground colour of the wings, and that an analogous variety occurs in the Forest of Quimperlé; in the neighbourhood of Rennes the ♀ appears to be constantly brown, without any scattered blue scales; the form from near Paris, seems to resemble closely that from Rennes. Nolcken states (*Lep. Fn. Estl.*, p. 54) that, in the Baltic Provinces, the ♀ often has traces of blue on the upperside. One of the most remarkable aberrations is that described later as *duplex*, Ckll., which has all the superficial appearance of a gynandromorph, although composed really of two halves, each representing an entirely different form of the ♀, one side being entirely brown, the other strongly shaded with blue. Blachier notes a ♀ from Digne, taken June 24th, 1907, and another from Uzès, June 11th, 1907, powdered with a bright violet-blue, the forewings of which have the base and the middle of the wing of this colour, the hindwings the lower half blue as far as the fulvous lunules. The specimen captured June 20th, 1902, by Leonhardt near Hüningen, in Upper Alsace, and described as a gynandromorph (Schultz, *Berl. Ent. Zeits.*, xlix., p. 81), is merely a blue ♀ (see Gillmer, *Soc. Ent.*, xx., p. 131). The St. Petersburg ♀s show good orange arches.

on all the wings, with slight blue shading at the base of hindwings. From Odalen, in Norway, the ♀ has the base of the forewings, and base and disc of hindwings, blue, the orange lunules of the hindwings well-developed, but faint on the forewings. A ♀ in the Brit. Mus. coll. from Gavarnie, has the blue scaling from the base to the orange lunules, the latter, however, very poorly developed on the forewing. We have already noted that in var. *masseyi* and var. *corsica*, this blue shading is racial. In some places, blue-tinted ♀ s are common without being racial, *e.g.*, at Delamere, where Arkle observes (*Ent.*, xl., p. 111) that "some of the ♀ s are beautifully shot with blue, particularly on the hindwings, the nervules marked out in black; a few of the ♀ s having the marginal red spots almost obliterated, whilst one specimen was of an unicolorous black hue, relieved only by a few scanty blue hairs in the region of the thorax." He further notes that "the marginal spots and orange-red crescents are much more marked, however, in specimens from Abersoch" (*Ent.*, xxxiv., p. 105). Turner notes (*Proc. South Lond. Ent. Soc.*, 1895, p. 42) that, among the ♀ s from Oxshott, he had obtained an example with the red blotches well-developed on upperside of all four wings, others with the upperside of the hindwings streaked with blue between the nervures; whilst Ashby also notes ♀ s splashed with blue from Oxshott. At Cuxton, the ♀ s of var. *cretaceus* are occasionally well-scaled with blue, but the blue is more distinctly violet (*violascens*) than is usual in the var. *masseyi*, although in this latter, two very marked shades occur *caerulescens* and *violascens*. Sweeting records a "blue ♀" from the Paignton district, and Norgate that he captured some ♀ s suffused with blue, and one ♀ with bright orange spots on the upperside of all the wings, at Tuddenham. Bankes says that, in Dorset, the ♀ s appear never to exhibit any blue colouring except for a few scattered blue scales occasionally to be seen at the base of the forewing. Lockyer records a ♀ taken in the New Forest, July 1873, as large as a large ♂, with the basal portions of the wing blue, as in the ♂, with the wing-rays brown, and also wanting the series of orange spots on the upper surface. Lowe notes (*in litt.*) that, in Guernsey, there are four forms of the ♀ —(1) entirely fuscous, (2) with orange lunules on upper wings (=ab. *anterocroceus* in series *suprà*), (3) with orange lunules on all the wings, (4) scaled with blue as in var. *corsica*, but finer than the latter; this form is rare. Chapman notes among his var. *casaicus* (captured in north-west Spain) a ♀ with a blue border (*caeruleomarginatus*) to the red spots of the hindwing, but without any blue on the disc. A remarkable aberration of the ♀ scaled with blue is figured by Millière (*Ann. Soc. Linn. Lyon*, 1865) with white antemarginal band, the underside being almost devoid of spots. The most beautiful specimen belonging to the "blue" ♀ group that has come under our notice, is one in the Brit. Museum coll., labelled "Mutzell coll., Berlin."[*] It has almost the white underside of a ♂ *hypochiona*, but the upperside, although entirely pale blue, has all the appearance of a ♀; the outer margin is narrowly dark inside the white fringe, and then, instead of the orange lunules surrounding the marginal spots, there is a series of pale whitish marks between the darker nervures; the hindwings are similar in colour, but the small black spots forming the marginal row are edged with white; the discoidals are visible on the forewings, but only faintly discernible on the hindwings. This extreme blue ♀ form we call *caerulea*, n. ab. In our British examples the amount of orange on the upperside of the ♀ s is generally small; there is usually a series of lunules on the hindwings, weakly continued on the forewings, but sometimes there are practically no traces of orange on the forewings, and occasionally it is absent on all; whilst the strong development of orange on the forewings is quite rare. Blachier notes (*in litt.*) that the ♀ s from near Geneva, and those from the Alps, are brown, with the fulvous lunules present or absent. He further states, that "one finds occasionally, in both sexes, that the black marginal spots of the hindwings are separated from the black line that edges the fringe, by a pure white line (one ♂ and one ♀ from Vernet-les-Bains, and one ♀ from Digne)." Reverdin states (*in litt.*) that the ♀ s he has, exhibit "every stage between those with only weak traces of orange lunules on the hindwings, and those that have them throughout the whole length of the fore- and hindwings." Hormuzaki notes (*Soc. Ent.*, viii., p. 18) that "the ♀ s from Mt. Cecina, near Czernowitz, exhibit markedly, on all the wings, a marginal row of distinct yellowish-red crescents up to the costa of the forewings; in other parts of the Bucovina, however, the ♀ s of this species have no red spots on the upperside of the wings, at most some black marginal spots towards the inner margin of the hindwings, which are, however, often of an uniform black colour," whilst Rebel observes (*Lep. Balkans*, pt. 1, p. 187) that "the ♀ s of the small form from Sofia and Slivno, are sometimes of an uniform dark tint on the upperside." The Bulgarian ♀ s are dark fuscous, with the orange lunules well marked on the hindwings, faint on the forewings. The lower Pyrenean ♀ s are rather brown, or even orange-brown, in colour, with orange lunules on all the wings, a white outer edge to the marginal dots of hindwings, and well-marked discoidal, reminding one of certain forms of *Aricia astrarche*. The form *bejarensis* shows very marked characters, varying much, however, in the amount of orange; most are fairly well-banded, but occasional specimens are exceptionally well-provided, whilst others are almost without. Gillmer observes that the ♀ s from Anhalt vary from pale to dark brown on the upperside, with a more or less developed marginal row of orange spots; the underside brownish-grey. We have already observed that there is a very distinct difference in the underside coloration of the sexes. The ground colour of the ♀ is a brown of different shades, from a deep coffee-brown to a pale brown or fawn colour, scarcely more than amber, the tint almost as distinct racially as the coloration of the ♂ underside. One of the most remarkable is the var. *corsica*, the underside of the ♀ of which is noted by Oberthür as the tint of café-au-lait, rather than more decided brown, the spots of the underside being also of the ground colour. He also notes the pale tawny colour of the underside of the ♀ of var. *hypochiona*. We have also already stated that the orange band on the underside is more strongly developed in the ♀ s than in the ♂ s. It is particularly brilliant in some of the continental races. It consists, in its simplest form, of a series of orange lunules surrounding inwardly the series of black marginal dots, and being in turn edged inwardly by a series of fine black lunules, but usually the orange lunules are united into a very distinct, transverse, subterminal band; this is followed by a transverse band of white, also, in its simplest form, consisting of a series of disunited lunules, but sometimes well-developed into a definite white band, more frequently on the hindwings than on the forewings. In some races it is very conspicuous. The Bosnian ♀ s are particularly noticeable for their larger spots on the underside, and white submedian band on the hindwings, one ♀ in the Brit. Mus. coll., has the white band well-developed on the forewings also. The various described forms of this species are as follows:

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[*] The specimens from this collection, which came to the British Museum coll., through the "Leech coll.," are absolutely worthless for most scientific purposes, as they have evidently come from far distant parts of the Palæarctic area, and bear no data, except the same absurd and useless legend "Mutzell coll., Berlin." It is most unfortunate that a very large number of these specimens have found their way into the collection at all, especially as this is often at the expense of really historical examples, which happened to be in rather less fine condition.

UNDERSIDE ABERRATIONS.

α. ab. *vulgaris*, Meyer-Dür, "Schmett. Schweiz," p. 67 (1851).—Alis subtus laetius cinereo-griseis, ocellis grandis. Switzerland (Meyer-Dür).

Wheeler notes that this presumably means "alis subtus latius cinereo-griseis, ocellis grandibus." Meyer-Dür seems to describe this in contradistinction to the next, possibly as the "meadow," as against the "heath" form, the latter being usually browner in its underside coloration than the former, but all the former are not large-spotted, nor all the latter small-spotted, whilst the lowland Valaisian specimens are often pale grey-blue in their ground-colour. It might even be compared in its underside characters, with *alcippe*, Stphs.

β. ab. *valesiana*, Meyer-Dür, "Schmett. Schweiz," p. 67 (1851).—Alis subtus fulvogriseis ocellis minutis. Switzerland (Meyer-Dür).

The "heath" form specimens, in certain sandy districts, are exceptionally brownish in the tint of the underside; the darkest we know come from Fontainebleau Forest, where, also, *P. argyrognomon* has an exceptionally brown underside in the ♂ s as well as the ♀ s.

γ. ab. *unipuncta*, Mousley, "Ent. Rec.," xiv., p. 341 (1902); Leonh., "Ent. Zeits. Güben," xviii., p. 53 (1904).—For the rare form of *Plebeius aegon* with a basal spot to the underside of the forewings, I propose the varietal name ab. *unipuncta*. The specimen happens to be a ♀ of the ab. (et var.) *corsica* form, and was taken by myself at Witherslack, in July, 1901. In addition to the already-mentioned variation, the black spots on all the four wings are large, and well-developed, including the metallic ones on the hindwings. The form with the one basal spot is found in *Polyommatus corydon*, *P. bellargus*, and *P. icarus* (ab. *iphis*), but I have never come across it, or heard of its occurring, in either *Polyommatus astrarche* or *Plebeius aegon*, until I captured the above specimen (Mousley).

Leonhardt notes (*Ent. Zeits. Guben*, xviii., p. 53) that he captured a ♀ of this form on July 14th, 1904, near Bernau, Brandenburg.

δ. ab. *caeca*, Grund, "Int. Ent. Zeits. Güb.," ii., p. 71 (1908).—♀. On the underside all the ocellated spots, except two small eyes on the right hindwing, are wanting; the discoidal spots are weakly indicated, and the brown colouring is, especially in the middle of the wing, traversed by white rays (Grund).

Blachier notes (*in litt.*) a ♂ taken at Digne, with only the discoidal lunules and the submarginal chevrons surmounted by orange colour, all the ocellated spots of the submedian rows having disappeared (=*extrema*).

ε. ab. *maritimus*, Stphs., "Cat.," 1st ed., pt. ii., p. 25 (1829); Dale, "Hist. Brit. Butts.," p. 79 (1890); Walk., "Ent. Mo. Mag.," xliii., p. 133 (1907). *Argus*, var. γ, Stphs., "Illus. Haust.," i., p. 94 (1828).—*Argus* γ, *maritimus*, Haw.

MSS. (*Cat.*, p. 25). With the ocelli united into longitudinal streaks. In Mr. Haworth's cabinet. Salt marshes near Holt, Norfolk (Stephens, *Illus.*, p. 94).

Dale's note (*Hist. Brit. Butts.*, p. 79) gives one the erroneous idea that Haworth really named *maritimus*, for he says, "in another, taken by Mr. Haworth in salt-marshes near Holt, Norfolk, and hence named by him *P. maritimus*, the ocelli on the disc of the underside of the wings are elongated into those on the middle of the wing, being almost confluent with the following row of spots." This specimen was in the "Dale coll.," when the latter was transferred to the Hope Museum. Writing of this example (*Ent. Mo. Mag.*, xliii., p. 133), Walker notes: "Another old ♂, probably from Haworth's coll., taken near Holt, Norfolk, and labelled '*maritimus*' at side, is very dark beneath, with the ocelli of the forewings much elongated." Asking for further information, Walker writes (*in litt.*, 24. ii. '09): "This specimen agrees closely with the ab. *radiata*, Obth., as figured in *Etudes Ent.*, xx., pl. iv., fig. 62, the chief difference being in the enlarged costal spots of hindwing, only one of which is abnormally large in the "Dale" specimen, instead of two or three as figured by Oberthür. The enlarged spots on all the wings are clear and distinct, not fused into one another. The ground colour of both wings (probably partly owing to age) is decidedly deeper in tint than usual, and, in conjunction with the slight enlargement of the spots of the hindwings, gives the specimen a markedly dark effect. The orange and black submarginal spots are very faint on the forewings, but clear and distinct on hindwings."

ζ. ab *radiata*, Obth., "Etudes," etc., xx., pl. iv., fig. 62, p. 28 (1896).—Our fig. 62 represents an English ♀ with elongated spots on the underside, from the collection of Howard-Vaughan. We possess also another ♀ from the "Prest coll.," with the black spots of the hindwings very much more confluent and elongated (Oberthür).

This is so near ab. *maritimus*, Stphs., that the name *radiata* really ought to sink; the only difference is that, in Oberthür's example, the first spot from the costa of the submedian row on the hindwing is enlarged quite to the next costal spot, which is not quite reached in the type of *maritimus*, the second spot of the submedian row is a little more extended in *radiata*, and the spot at the anal angle is joined to the spot on the inner margin, forming an I-like mark parallel with the margin. The two forms are, however, exactly of the same type of extension, *viz.*, the spots of the submedian row alone are extended basally, and not formed by the union of the terminal and submedian rows of black spots as in our ab. *juncta*.

η. ab. *juncta*, n. ab.—♂. Remarkable underside aberration of striate form, but entirely different from those already described. In this, the dark marginal series of black lunular dots, forming the internal edging of the orange series, are united with the submedian series so as to form lineated streaks, six on the right forewing, of which the first, second, and third streaks have extra dots between themselves and the discoidal, whilst the fourth, fifth, and sixth, are much extended towards the base. The left forewing is like the right, but without the extra tiny spot that follows streak one. The eight streaks on the hindwing are formed in exactly the same manner, but are thinner medially than at the ends; the first on the left hindwing is extended along the costa to meet the large first basal, but on the right this is separate; also the two spots forming the seventh streak, are not quite joined on the left hindwing. The yellow on the underside of this specimen is very pale. "Sils, 1865. Frey coll." (Described from the example which is now in the British Museum coll. 20. ii. '09).

θ. ab. *approximata-juncta*, n. ab.—A ♀ specimen in our collection shows the line of development of the above form, the two series of spots being elongated, and approaching one another so as nearly to unite, but only doing so in two instances; it thus just falls short of becoming ab. *juncta*. Captured July 31st, 1907, in the Göschenen-Thal.

ι. ab. *obsoleta-juncta*, n. ab. *Argus* ab., Krod., "Allg. Zeits. für Ent.," ix., pp. 49, 53, 109, 137, fig. 20 (1904).—Forewings with all the spots on the underside obsolete, except the discoidal; the hindwings with eight well-defined streaks formed by the union of the black inner margins of the orange lunules with the spots in the submedian series as in ab. *juncta*.

The type of this aberration is figured by Krodel (*Allg. Zeits. für Ent.*, ix., p. 53, fig. 20). The discoidal spots present in all wings, and three basal spots in hindwings. He notes it (*op. cit.*, p. 137) as a ♂, and adds (p. 109) that it was the result of a low temperature experiment. He gives some details (p. 49) of the experiment which was performed on five pupæ, from which no fewer than three aberrant specimens emerged, of which this was one. [Krodel's reference of Herrich-Schäffer's fig. 247 to this species, instead of to *P. argyrognomon*, is evidently an error; Oberthür figures this aberration (*Etudes*. xx., pl. iv., fig. 53) as *P. argyrognomon* ab. *subtusradiata*, in accordance with Herrich-Schäffer's indication.]

κ. ab. *cuneata*, n. ab.—Forewings with the spots obsolete, even the marginal series being only faintly indicated. The hindwings with the spots also obsolete, except that the black inner marginal arches of the obsolescent orange lunules are developed into a series of cuneiform streaks, which are only faintly indicated on forewing. The specimen described was taken at Bérisal, on June 29th, 1906, by Mrs. Prideaux.

This differs entirely from the last-described form, in that the streaks are not made up by the union of the spots in the submedian and submarginal series of black spots, but by the extension of the latter (the inner black edges of the orange lunules) only, the former being entirely absent.

λ. var. *leodorus*, Gerh., "Mon. Schmett.," p. 13, pl. xxiii., figs. *a-c* (1853); Wllgrn, "Skand. Dagf.," p. 207 (1853).—Has no silver spots on the underside (Gerhard).

The illustration represents a moderate-sized form, the ♂ slightly larger than the ♀. The ♂ is of a brightish purple-blue, with broad, well-defined, black border; the ♀ bright dark brown, with an orange lunular band on the hindwing, and a narrower, less distinct, and less lunular band on the forewing; the underside of the ♀ shows a bright orange band within the black marginal spots, followed by a clear broad white band on the hindwing, and a series of small white wedge-shaped spots on the forewing; the ground colour is a coffee-brown; no metallic spots. The underside of the ♂ is not represented, but it is described as being without silver spots. The ♂ is in colour, size, and breadth of border, almost a facsimile of the type specimen in the Linnean collection, except that the border is less suffused, and that there are no metallic spots beneath; the underside of the ♀ also corresponds, with the same exception, to Linné's ♀, but the upperside of the latter sex has, in Gerhard's insect, much more orange than in Linné's "*idas*" (Wheeler).

UPPERSIDE ABERRATIONS.

α. ab. *alcippe*, Stphs., "Ins. Cat.," pt. ii., p. 25 (1829); Dale, "Hist. Brit. Butts.," p. 79 (1890). *Argus* var. *β*, Stphs., "Illus. Haust.," i., p. 94 (1828).—*Argus* var. *β*, *Pa. alcippe*, Kirby MSS. (*Cat.*, p. 25).—♂. Smaller, the wings

narrower, blue above, with a broad black margin to all the wings; the underside of the ♂ of a deep greyish, or drab, colour; the ocelli very distinct, as in the ♀, and the oblique series on the posterior wings consisting of four (Stephens, *Illus. Haust.*, i., p. 94).

β. ab. *obscura*, Grund, "Int. Ent. Zeits.," ii., p. 71 (1908).—♂. The entire wings on the upperside blackened to such an extent that only when looked at sideways is a slight blue shimmer perceptible. The underside is normal, but for the slightly darkened colouring (Grund).

γ. ab. *bella*, H.-Sch., "Sys. Bearb.," i., p. 127, pl. xlix., suppl. figs. 227, 228, ♂ (1842); [Gerh., "Mon. Schmett.," p. 21, pl. xxxvii., figs. 1*a-b* (1853);] Staud., "Cat.," 1st ed., p. 4 (1861); 2nd ed., p. 10 (1871); Lampa, "Ent. Tids.," vi, p. 13 (1885); Rühl, "Pal. Gross-Schmett.," i., pp. 232, 751 (1892-5); Reuter, "Act Soc. Faun. Flor. Fenn.," ix., no. 6, p. 13 (1893); [Tutt, "Brit. Butts.," p. 183 (1896);] [Staud., "Cat., 3rd ed., p. 78, *in part* (1901);] Lamb., "Pap. Belg.," p. 224 (1902).—Nearest to *aegon*, with the same formation of the front legs, and the same shape, not larger than the smallest examples of it.* A shining violet-blue, the border of the forewing broadly black, that of the hindwing with black oval spots, those in cells 1c and 2 bounded towards the base with orange. The fringes black on the nervures of the lower half. Lighter, and more reddish-grey beneath, the marginal line indistinct, dark at the nervures only; all the marginal spots of the hindwing, from cell 1*b* to 7, large and silver-blue throughout, those of the forewing sharp and three-cornered, the following row of hatchet-shaped spots fine and sharp, the row of eye-spots conspicuously nearer together, and much less curved; the base of the hindwing greenish-silver. Herr Bischoff obtained a ♂ from the neighbourhood of Broussa. Its right to the position of a separate species still needs confirmation (Herrich-Schäffer).

The special characteristics of this form are:—The orange lunules above the last two black spots of the marginal row on the upperside of the hindwing; the larger size of the marginal spots on the underside of the same wing, in conjunction with the diminution of the orange band and the inner row of ocellated spots; and the greyer ground colour of the underside, which, however, is hardly lighter than in many European specimens. [The illustration in Gerhard, though evidently not taken from the same specimen, has the same characteristics. There is no comment on this form in the text of the latter, beyond the word "Türkei," and a reference to Herrich-Schäffer.] Both illustrations show it to be a form of *aegon*, though Herrich-Schäffer gives it with hesitation as a separate species, grouped with *aegon*, and separated, on account of the front tibiæ, from *argus* (*argyrognomon*). Lampa's description is little more than a condensed form of the original: "Smaller, hindwings above with round black spots near the hind-margin, the two hindmost of which have, on the inside, rounded borders of reddish-yellow; lighter on the underside, with greenish bases. South and central (?) Sweden, Norrbotten, Norway, south and central Finland, Denmark."

δ. ab. *rufolunulata*, n. ab. *Bella*, Gerh., "Mon. Schmett.," pl. xxxvii., fig. 1*a*, *b* (1853).—The example figured in *Bull. Soc. Lép. Gen.*, pl. x., fig. 1, was taken, July 8th, 1907, at Schallberg (Simplon), in the locality in which *lycidas* is found in abundance. It is characterised by the presence of tawny lunules, surmounting the black marginal spots; these lunules are four in number, but the first (at the anal angle) and the fourth are merely indicated by some scales, whilst the two others are very distinct, and their crescent form with the concavity behind, well marked. On examining carefully the *argus* (*aegon*) of my collection, I found indications of these lunules in two other specimens, a ♂ from Alpienalp (Simplon), July 12th, 1907, and the second from Randa, July 15th, 1895, these traces of lunules occupy the same position as in the example from Bérisal, the fulvous scales are less numerous, but evident, nevertheless, when examined with a lens. These three examples otherwise present the characters of var. *philonomus*, two measuring 20mm., and the third 21mm. (Reverdin).

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* It is, according to the illustration, about the same size as an average English specimen, and by no means so small as the alpine form (Wheeler).

We are indebted to Dr. Reverdin for an advance copy of his description of this aberration, which is to be published and figured in the *Bull. Soc. Lép. Gen.*, 1909, pl. x., fig. 1, as he desires that it should be noticed in our work. This form can only stand apart from *bella*, H.-Sch., as an aberration of the var. *philonomus*, whilst *bella* is the parallel ab. of the var. *orientalis*. It appears to us that Gerhard's figure belongs here, rather than to the *orientalis* race from Asia Minor (see *suprà*).

ε. ab. *duplex*, Ckll., "Ent.," xxii., p. 6 (1889). *Ægon* var., Bond, "Ent. Mo. Mag.," ix., p. 200 (1872); "Ent.," vi., p. 341 (1873). *Ægon* gynand., Schultz, "Illus. Zeits. für Ent.," iii., p. 102 (1898).— ♀. A specimen having the right hindwings plain brown, those on the left hand blue; at first sight it has the appearance of a gynandromorph, but is in reality a ♀, combining the two forms of that sex (Cockerell). Taken in the New Forest (Bond).

ζ. ab. *falloui*, n. ab. *Ægon* var., Mill., "Ann. Soc. Linn. Lyon," p. 436, pl. lxi., fig. 7 (1865).— ♀. This beautiful aberration, which is of great size, differs from the type in having a bluish tint spread over the wings chiefly on the secondaries, a white discal spot strikingly indicated on all four wings above and below, and, on the upper-wings, white rays, the bases of which rest on the brown subterminal line. The underside, the ground colour of which is less brown than the type, does not differ perceptibly from the latter, except that the numerous black spots are replaced by white. Lastly, the metallic green at the base of the wings is absent. Taken at Montpellier, by Mr. Fallou, in July, 1857 (Millière).

The illustration shows a brown ♀ with lilac-blue suffusion on the hindwings, and brighter blue along inner margin and lower nervures of forewing, a suffused white, antemarginal, band on the hindwings, containing a row of black spots, an antemarginal band of large, white, wedge-shape spots pointing towards the disc on the forewings, and striking white discoidal spots on all four wings. The underside is not illustrated.

η. ab. *caeruleo-cuneata*, Ebert, "Soc. Ent.," xxii., p. 169 (1908).— ♀. Alis posterioribus supra radioforme cæruleis cuneis. There are, on the upperside of the hindwing, quite regular, radiating, narrow, sky-blue wedges, the bases of which are set closely on to the red marginal lunules, whilst the very sharp points lose themselves in the ground colour of the base of the wing. Also near the wing-bases, one sees in addition a few blue scales. On each hindwing are five of these radiating wedges, between which the brown ground colour is visible in very narrow streaks. The general impression given by the hindwings is in consequence definitely blue. Taken at Stahlberg, near Cassel, July 22nd, 1907 (Ebert).

θ. ab. *argyrotoxus*, Bergstr., "Nom.," ii., p. 77, pl. xlvii., figs. 3-4 (1779); Staud., "Cat.," 2nd ed., p. 10 (1871).—*P.P.R.* alis rotundatis integerrimis fusco coeruleis, subtus utrisque fascia fulva, senisque pone eandem in postica pupillis argenteis. With rounded, unicolorous, black and blue wings, a transverse orange band on the underside of all the wings, and six silver pupils on the outer margin of the hindwings. Probably the ♂ of the following (*argyra*), and the *aegon* of the Vienna entomologists. It ought to be called the "Geisklee (or Cytisus) butterfly," on which plant the larva is said to feed (Bergsträsser).

The main feature of this form is the strongly-developed series of metallic spots on the underside of the hindwings. Is is evidently intended for the normal, strongly-margined, form of *P. aegon*, but its wings are of too bright a blue colour, and the outer marginal border of all four wings is black, the fringes white. The underside has rather large spots; the transverse orange band on all wings is well-developed. and the white band inside the orange equally so in the hindwings, but only existing as a series of marginal lunules to the orange spots on the forewings. Wheeler notes (*in litt.*): "No doubt Bergsträsser is right in his surmise that these (*argyrotoxus* and *argyra*) represent the ♂ and ♀ *aegon*, though the ♂ is, in the illustration, of a "royal" blue, and the border is not sufficiently suffused; the ♀ and the underside seem to settle the question. *Argyra* shows an exterior edging of bluish-white to the spots on the hindwing of the upperside."

ι. ab. *argyra*, Bergstr., "Nom.," ii., p. 78, pl. xlvii., figs. 5-6 (1779).—*P.P.R.* alis rotundatis integerrimis fuscis, annulis in postica senis fulvis; subtus fascia utrisque fulva, senisque pone eandem in postica pupillis argenteis. With rounded, uniformly brown, wings, six orange lunules on the hindwings; on the underside an orange transverse band on all the wings, with six silver pupils in the spots on the outer margin of the hindwings. Probably the ♀ of the preceding (*argyrotoxus*), and the ♀ of *aegon* of the Vienna entomologists. It is quite distinct from *argus*, owing to its size (Bergsträsser).

The main characters of this form are the strongly-developed character of the metallic spots on the underside of the hindwings, the restriction of the orange lunules on the upperside to the hindwings, and the pale blue antemarginal edging to the hindwings. As figured by Bergsträsser, it is a ♀ with unicolorous forewings, with darker nervures and discoidal lunule, the hindwings with a marginal band of ocellated spots margined with reddish above, and with bluish on the outer margin. The underside is dark grey as in the ♂ *argyrotoxus*: the submedian row of ocellated spots well-developed, the orange band clearly defined; the white transverse band between the orange band and submedian row of spots particularly well-marked; the metallic kernels of maximum number and size. [This figure shows the necessity of caution in considering the details of hand-painted illustrations. Our first description of the underside of this figure was made from the copy of Bergsträsser's work in the library of the Zoological Soc. of London, and reads as follows: "The underside is most exceptional. The ground colour is pure white, on which the usual black spots stand out conspicuously (the usual white rings, of course, quite lost in the ground colour); the submarginal orange band of all four wings normal. As Bergsträsser suggests it as the ♀ of *argyrotoxus* (fig. 4), one wonders whether the figure is unfinished, and that he has overlooked the grey ground-colour, which he, perhaps, intended to add last, which is very characteristic of his fig. 4. On the other hand, he may have had a figure just like the one he has pictured in fig. 6, but one suspects not in a ♀. The ♂ *hypochiona* has quite white underside, but the ♀ *hypochiona* is pale ochreous or pale brown." The other description (noted above) was made from the copy of this work in the library of the Natural Hist. Museum, South Kensington, and it will be seen that our surmise that the figure was unfinished proves to be accurate.]

κ. ab. *argyrophalara*, Bergs., "Nom.," iii., p. 10, pl. liv., figs. 1, 2 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 83 (1780).—*P.P.R.* alis angulatis fuscis maculis anticarum; annulis posticarum fulvis; pupilla subtus unica in posticis pone fulvam fasciam argentea. Wings angled, brown, the fore- and hindwings margined with yellow lunules; on the underside, beyond the orange transverse band, a single silvery pupil. This ocellated butterfly bears great similarity to *argyra* (pl. xlvii., figs. 5-6); but the difference in the ocellated spots is conspicuous. The one has no orange spots on the forewings, and also has six clearly defined silver pupils beyond the red transverse band (on the underside of the hindwing); on the contrary, *argyrophalara* has only a single one, of a glistening, greenish-blue tint; it has, on both fore- and hindwings, throughout beneath, between the orange transverse band and the submedian row of black ocellated spots, a whitish area shaded with brown, which, in *argyra*, only shows on the hindwings; the underside, because of this white field, resembles very much that of *argus*, but our *argyrophalara* has more ocellated spots (Bergsträsser).

The main characters of this form are the presence of yellow lunules on the upperside of all the wings, and the restriction of the silvery spots to a single kernel at the anal angle of the underside of hindwings. The figure represents the ♀ form of *argus* (*aegon*) in which the upperside is fuscous in colour, and all the wings have a marginal series of pale yellowish lunules. The underside is brown in colour; the orange submarginal band well-developed, the spots also well-developed and outlined with white, but neither on the fore- nor hindwings is there a distinctive white band inside the orange, as stated in the description. Wheeler says (*in litt.*) that "the remarks, 'Very like *argyra*, it has, however, on both wings on the underside, through the whole space between the orange band and the collection of black ocellated spots on the disc, a whitish ground colour, shaded with brown, which in *argyra* only shows on the hindwing,' do not at all correspond with the figure, in which there is no white, or whitish, band at all on the hindwing inside the orange border, but, between the orange band and the margin, the whole ground colour is white on both wings, and contains small black spots and one silvery-blue spot on the hindwing near the anal angle. On the forewing there is a series of whitish wedge-shaped dashes pointing inwards inside the orange band. The eye-spots of the underside are large, and placed somewhat in the form of a P on the forewing, and of a D on the hindwing; they are not unlike those of *P. zephyrus* var. *lycidas*." As Bergsträsser's figures vary in different copies of his work, we must follow the description, not the figure.

LOCAL RACES.

a. var. *philonomus* ♂, Bergstr., "Nom.," ii., p. 73, pl. xliv., figs. 7-8 (1779); Göze, "Ent. Beit.," iii., pt. 2, p. 79 (1780); Bkh., "Sys. Besch.," i., p. 166 (1788); Herbst, "Nat. Syst. Ins.," xi., p. 258, pl. cccxvi., figs. 11-13 (1804). *Philonome* ♀, Bergstr., "Nom.," ii., p. 72, pl. xliv., fig. 6 (1779); Bkh., "Sys. Besch.," i., pp. 166, 280 (1788). *Ægidion*, Meiss., "Naturw. Anz.," p. 88 (1818); Charp., "Germ. und Zinck. Mag.," iv., p. 395 (1821); Meig., "Eur. Schmett.," ii., pp. 33-4 (1830); Meyer-Dür, "Schmett. Schweiz," p. 66 (1851); Gerh., "Mon. Schmett.," p. 13, pl. xxiii., figs. 4*a-c* (1853); Christ, "Jahrb. Nat. Ges. Graub.," xxvi., p. 11 (1883). *Ægon* var., Meig., "Eur. Schmett.," ii., p. 31, pl. xlix., figs. 6*d-e* (1830). *Alpina*, Wheeler, "Butts. Switz.," p. 42 (1903); Rehf., "Bull. Soc. Lép. Gen.," i., pt. 3, p. 258 (1908).—*Philonomus* ♂. *P.P.R.* alis rotundatis integerrimis cœruleo nigris, infra cinerascentibus, ordinibus ocellaribus quattuor, fasciaque inter primos ad marginem fulva. With rounded, quite unindented wings, black-blue, ash-coloured beneath, and four arcuate rows of eye-spots, the space between the two outermost of which are filled with orange. Probably the ♂ of the preceding (*philonome*) (Bergsträsser). *Philonome* ♀. *P.P.R. philonome* alis rotundatis integerrimis fuscis, infra cinerascentibus, ordinibus ocellaribus quatuor, fasciaque inter primos ad marginem fulva. All the wings unicolorous brown, ashy-grey beneath, with four arcuate rows of ocellated spots, and a reddish-yellow band between the two outer rows. This ocellated butterfly, with an orange band on the underside, is in no way that smallest "Argus" of Schäffer and Esper, which shows that these authors have been too hasty in naming their insect *minimus*, for here is another species, still somewhat smaller than our *pseudolus* (= Esper's *minimus*). Among those species with no orange transverse band, I certainly know none smaller than *pseudolus*, but this does not deserve the name "Argus" butterfly, because the orange is quite absent. Apparently it is the ♀ of the next insect (*philonomus*) (Bergsträsser).

Bergsträsser's *philonomus* is the ♂, and his *philonome* the ♀ of the small mountain form of *argus* (*aegon*). The figure of the ♂ is darkish blue, with a rather broad and distinct black border to all four wings; that of the ♀ is fuscous in tint, with no orange spots on the upperside; the underside is typical of that of the mountain race, with a well-developed orange, submarginal, transverse band, edged internally with a white band. There can be no doubt that this is also the *aegidion* of Meissner, which he described as a distinct species, and of which he writes:

> I consider that under this name, a butterfly which we meet with in the higher Alpine valleys, *e.g.*, in the Urserenthal, and even on the high Alps, *e.g.*, on the south side of the Grimsel, must be separated from the preceding species (*aegon*). It is certainly very near to *aegon*, but differs from it: (1) In its small size, in which it is scarcely larger than *alsus*. (2) The ground colour of the upperside of the ♂, which is of a much more violet-blue than *aegon*. (3) The spots of the underside which show more or less through on the upperside. (4) In the middle of the forewing a black line appears on the upperside. (5) The position and number of the spots on the underside is as in *aegon*; but in the ♂ the golden-green points are wanting in the marginal spots of the hindwing. The ♀ is brown on the upperside, rarely with a slight dark blue dusting; the border (fringe) dirty whitish-grey; on the hind-margin of the hindwing are more or less distinct orange spots and black marginal dots, which show, also, in more restricted dimensions, on the forewing, always, however, more weakly, and often failing here altogether. The underside is brown-grey; all the spots are more strongly marked, and the marginal spots of the hindwings have golden-green kernels.

In the view that this was a distinct species, he was followed by Charpentier and Meigen, the latter of whom, also, figured this form (though not by name) as a variety of "*aegon*." Herrich-Schäffer gives it as a synonym of "*aegon*," and Meyer-Dür, in 1851 (*Schmett. Schweiz*, p. 66), recognised it as the small mountain form of this species, and also as being identical with the *philonomus* and *philonome* of Bergsträsser; Gerhard also placed it correctly. Staudinger seems to have been the first to misplace it as a variety of "*argus*" (*argyrognomon*) (*Catalog*, 1st ed., p. 4, 1861), an error in which he has apparently been followed by almost all subsequent authors. Oberthür makes (*Etudes*, xx., p. 27) this (as many authors have done) a form of *argus* (*argyrognomon*), but the description of Meissner is definite. There can be no doubt that the application of this name to any form of *argyrognomon* cannot be at all justified. This form is also the *alpina* of Wheeler (and the later Swiss lepidopterists) which he notes as the "usual form of the mountains, not exceeding 23mm., sometimes less, with rather dark ground colour, occurring very commonly in July and August, 1898, and beginning of July, 1902, at Bérisal." It is recorded from the Ganter Bridge, Laquinthal, Alpien, Rossboden Alp (Rehfous), the Steinenthal (Wheeler), the Grammont, Dent du Midi (Muschamp), etc. Our specimens have come from Arolla, the higher valleys above Courmayeur, etc.

β. var. *killiasi*, Christ, "Jahrb. Nat. Ges. Graub.," xxvi., p. 10 (1883); Killias, "Nachtr. Ins. Graub.," p. 5 (1886).—One of the most striking of the Tarasp butterflies, which we may well consider entitled to a special name as a local race. It differs from the type in the striking smallness of the ♀, with regard to the ♂, and especially in the colouring of the upperside of the ♂. Next to the broad white fringe comes a broad black band, which on its inner side disappears in the form of rays towards the base, in such a way that often only a third or a fifth of the expanse of the forewing remains for the very dark bright blue. This gives to the butterfly a very special facies. Specimens which approach those of the rest of Switzerland, in consequence of having a broader blue area, are rare at Tarasp. The Tarasp form is not found in the Valais. The underside is somewhat darker than in the lowland form, lighter than in *aegidion*, Meissn. The ♀s are of the normal dark brown. Only in the mountain-region of Tessin, at Faido and Dalpe, at about 1000 mètres altitude, have I found similar specimens, and these not of quite so deep a colour as our var. *killiasi* (Christ).

This is the form of the southern slopes of the Swiss Alps, the ♂ of which has largely the general facies of the var. *philonomus*, but is larger, and has a much wider marginal border to all the wings. We have taken it commonly between Guarda and Lavin, at Brugnasco, Piotta, etc. It is very near the *aegon* of the Austrian mountains.

γ. var. *aegon*, Schiff., "Sys. Verz.," 1st ed., p. 183 (note) (1775); Schneid., "Sys. Besch.," p. 252 (1787).—The 14th (*argus*) and 15th (*aegon*) species differ from the others in the bluish-silver eye-spots of the underside ("ocellis caeruleo-argenteis," Linn., *Sys. Nat.* and *Fn. Suec.* de *P. argo*); but since this row of silver spots on the hind-margin is common to the two species, the question follows: what is the most constant mark of the difference between these? In conjunction with the broad black outer margin of the second, the width, twice as great, of the first, and the black spots projecting into the blue ground of the hindwing from the black border, the chief distinction is the undeniable difference between the caterpillars which have now been discovered, and which once for all settled our long uncertainty whether to divide these insects into two species, or to unite them in one (Schiffermüller).

This is evidently the Austrian valley form with broad black margin to the wings, which we have from various localities in the Tyrolean, and Carinthian, Alps, and of which there are several specimens in the British Museum coll. Schneider described (*Sys. Besch.*, p. 252) the insect as follows: "Alis ecaudatis cæruleis, margine latiore nigro, subtus limbo ferrugineo, ocellis cæruleo argenteis. Under this name the 'Wiener Verzeichniss,' pp. 185 and 183, mentions in its annotations a butterfly very like the preceding (*argus*), and, apart from the totally different caterpillars, only to be separated by the following distinctions—only half the size of the preceding, the black border broader, and no black spots coming from the border into the blue ground colour."

δ. var. *aegiades*, Gerh., "Mon. Schmett.," p. 19, pl. xxxiv., figs. 4*a-c* (1853).—This variety, which is specially found in this locality, is distinguished from typical *aegon* by its size, by the absence of the line [discoidal spot] on the upperside of the forewing, and the arrangement of the spots on the underside. North Germany (Gerhard).

The ♂ shows a large form of *aegon*, but the ♀ is smaller, the underside in the plate is that of the latter. The white band within the orange spots is much less distinct than usual, the outer of the two subcostal spots of the underside hindwing is further from the base than in the figure of the typical *aegon*, and there is a 4th basal spot on the hind margin. There are, however, no metallic spots. The ♀ is brown on the upperside, with a succession of slightly lunular orange dashes on the forewing forming a band, with a band of more definite lunules on the hindwing, enclosing a row of indistinct dark spots between themselves and the hind margin. Wheeler adds: "A very usual form of *aegon* in the Rhone Valley, *e.g.*, at Bouveret." It appears to us to represent distinctly the "plain" form of Central Europe, except that it has no metallic kernels to the marginal spots on the underside of the hindwings.

ε. var. *orientalis*, n. var. *Bella*, Staud., "Hor. Soc. Ent. Ros.," xiv., p. 234 (1878); Lang, "Butts. Eur.," p. 106 (1884); Rühl, "Pal. Gross-Schmett.," i., pp. 232, 751

(1892-5); Tutt, "Brit. Butts.," p. 183 (1896); Wheeler, "Butts. Switz.," etc., p. 43 (1903).—♂. Of moderate size, the tint not much (if any) brighter than that of the specimens from Central Europe, the border on the forewings rather narrow, sometimes broken up into dots; the marginal border of the hindwing consisting entirely of interneural dots. The ♀ dark fuscous, with a variable band of orange lunules on the wings, sometimes developed on the hindwings and absent on forewings, more often developed into a complete orange submarginal band. Underside ♂, pale grey, with whitish submedian band, well-developed spots, and orange lunules; ♀ brown, well-developed spots, white submedian band and strongly-coloured orange band on all the wings.

This western form, from Asia Minor and Persia, is very nearly like that of Central Europe. There are a number of specimens of this race under the name of *bella* in the British Museum coll., which are little different from the central European form. In certain side-lights some examples suggest a faint orange shade, where are the orange lunules in Herrich-Schäffer's illustration of *bella*, but under a lens actual orange scales cannot be really traced. These specimens come from (1) Brussa, two ♂s and two ♀s "(Dieckemann, 1892)," whence came Herrich-Schäffer's original example of *bella*. Of these, one ♂ has a narrower border on the forewings than the other, which agrees with a Caspian example labelled "Emba river, viii., '97 (Grum-Grshimailo)," and is not far from a Hyrcanian ♂ from the "Zeller coll.," labelled "*bella*; Hyrcania (Huene); Zell. coll.," a specimen of undoubted *aegon*, of moderate size, fairly good borders to forewings, hindwings with distinct marginal dots; with these is a ♀, dark, no orange on the upperside except the slightest trace of lunules on hindwings. A ♂ and ♀ labelled "N. Persia (Funke, '84)" are of exactly the same form as Zeller's pair in both sexes. The Brussa ♀s, however, are different from these, being rather small, and with a bright orange band on all the wings. Besides these are two specimens, ♂ and ♀, labelled "*bella*; Asia Minor, ex Staudinger (Godman-Salvin coll.)." The ♂ has a narrow border to the forewing, and dark marginal dots to hindwing, the ♀ with orange (nearly a band) on all the wings. These specimens, no doubt, all belong to the Asia Minor race of which Staudinger writes (*Hor. Soc. Ent. Ross.*, xiv., p. 233): "I first took this species on June 4th, 1878, on the Jenikeui plateau, flying commonly till the middle of July in scattered grassy places. These examples have a narrow, quite broken, black border to the forewings, whilst, on the hindwings, there is usually a marginal row of spots. This appears to me to be characteristic of the *bella* ♂ as figured by Herrich-Schäffer, so that I consider these taken near Amasia to belong to that form. Herrich-Schäffer's figure, however, shows a few faint red marginal spots on the upperside of the hindwings, which, however, do not appear in any example from Amasia, but I consider this quite a secondary matter. [A large ♂ *argus** (=*argyrognomon*), taken by me in Castile, has similar red marginal spots as an aberration.] On the other hand, the ♀s of *aegon* taken near Amasia, show many more red marginal spots, on the fore- as well as hindwings, than the German specimens, and yet, in one ♀, they are almost entirely absent. Two ♀s exhibit on the forewings, as well as on the hindwings, faintly scattered blue streaks. . . . . Mann took *aegon* in July, near Brussa, not rarely." This race is very fairly represented in the British Museum coll., and the examples quite contradict Oberthür's conclusions (*Etudes*, xx., p. 27) that "Staudinger is mistaken in referring *bella* (from Brussa) to *aegon*," and that "it should be referred to *argyrognomon*." On this point Wheeler writes (*in litt.*): "Oberthur's reference of this form to *argus* (*argyrognomon*) (*Etudes*, xx., p. 27), with the observation that Staudinger is mistaken in referring it to *aegon*, as he has received specimens from Asia Minor which belong to the former species, merely implies that Oberthür's specimens from the Barud Dagh are not of the same species as Herrich-Schäffer's (and those in the Brit. Mus. coll.) from Brussa, etc., as the original description leaves no room for doubt as to the species to which *bella* belongs." Oberthür's *argyrognomon* (which he refers to *bella*) came from the Taurus—Barud Dagh—at least 250 miles in a straight line from Brussa. We look on *bella*, H.-Sch., as a mere aberration of our var. *orientalis*.

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* At this time (1878) Staudinger considered the Spanish *hypochiona* to be *argyrognomon*. We have examples of *argus* taken by Chapman at Canales, Brañuelas, Vigo, Casayo, etc., with similar red spots; so that this form occurs as an aberration in most of the Spanish races (see *posteà*).

ζ. var. *iberica*, n. var.—Of fairly large size, ♂ 30mm., ♀ 28mm. The colour of the ♂s a bright purplish-blue, the black borders broad, somewhat suffused for a short distance along the nervures, the hindwings suffused marginally, so that the spots, conspicuous in *hypochiona*, *bejarensis*, etc., are largely lost in the marginal shade, which is continued finely along the nervures, the costa of the hindwings also much suffused; the fringes pure white, with a trace of grey at the termination of each nervure. The underside is silvery-white, strongly tinged with bright blue scaling at the base; the spots very black, but not larger than usual; the orange lunules bright on the hindwings, continued, but less brilliant, on the forewings; the ♂ sometimes without metallic spots. The ♀ dark fuscous-brown, the orange lunules continuous on the fore- and hindwings (fainter towards costa of forewings); the fringes grey; the underside of a pale fawn colour, the spots black, with white rings, the orange band strongly developed and continuous on all the wings; the white transverse band well-developed on the hindwings; the spots moderately large; the metallic spots better developed than in the ♂.

The specimens from which this form was described, were captured at the foot of the mountains near La Granja, between June 15th and July 15th, 1908 (Lowe); it is really closely connected with var. *hypochiona*, except that the band on the upperside of all the wings is wider and more suffused, and the hindwings consequently do not conspicuously show off the marginal spots of the hindwing as in that variety; nor is the underside of the ♂ so purely white.

η. var. *hypochiona*, Ramb., "Cat. Lep. And.," p. 35 (1858); Staud., "Cat.," 1st ed., p. 4 (1861); "Hor. Soc. Ent. Ross.," vii., p. 48, *in part* (1871); "Cat.," 2nd ed., p. 10 (1871); Obth., "Etudes," v., p. 22 (1880); Lang, "Butts. Eur.," p. 106 (1884); Kane, "Eur. Butts.," p. 36 (1885); Rühl, "Pal. Gr.-Schmett.," p. 234 (1892-5); Obth., "Etudes," xx., p. 28, pl. iv., fig. 61 (1896); Staud., "Cat.," 3rd ed., p. 78 (1901); Lamb., "Pap. Belg.," p 224 (1902); Siépi, "Ann. Mus. Mars.," ix., pt. 2, p. 38 (1905).—"Alis integris supra violaceo-cæruleis, anticis margine externo intus radiato, posticis punctis marginalibus fuscis; subtus cinereo-niveis, nigro seriatim punctatis, seria media intus angulata, lunulis fulvis submarginalibus; posticis viridi-argentis notatis, tibiis anticis submucronatis (mas). Intermediate between *argus* and *aegon*, but nearer to the latter, particularly in the genitalia and the black border of the forewings. The upperside of a rather dark violaceous-blue, the forewings with a wide black margin extended along the nervures; the hindwings have a series of brown spots sometimes slightly confluent exteriorly, at other times separated from the margin and edged with blue. The underside ashy-white, almost shining, with the median row of black spots angled below its centre, and several black marginal spots marked with silvery-blue scales as in *aegon*, the fulvous lunules are somewhat like both the species mentioned. The fringes are broadly white. The anterior tibiæ have a small, more or less conspicuous, spine, but always less than in *aegon*, sometimes almost absent. The ♀ is sometimes black above, sometimes shaded with blue, with a submarginal border of fulvous lunules, sometimes confluent on all four wings, sometimes with none on the forewings, and more or less reduced on the hindwings; there are often black dots external to these, with an outer bordering of white. It differs from *argus*, which it equals in size, by the wide black border of the forewings, by the wider white fringes, by the black spots on the hindwings, usually absent in *argus*, or not bordered with bluish-white, by the very often well-marked tibial spine, and lastly by the knob of the longer antennæ, coloured as in *aegon*, which differs, however, from it, in the four wings being equally bordered with black, and by the stronger tibial spine. Common in the mountains of Granada (Rambur).

Staudinger referred this (*Cat.*, 2nd ed., p. 10) to *P. argyrognomon*, with which it has really nothing in common; in the 3rd ed., p. 78, he treated it as a var. of *argus*, with the diagnosis "major subtus albicans," to which he adds "an *argyrognomon* var.?" Our best-marked examples of this race (excluding *casaicus* and *bejarensis*) come from Guéthary, 6. vii. 1907; Tragacete, 18-26. vii. 1901; Cuenca, 1-14. vii. 1901; and Canales, 27. vi.-9. vii. 1901. These have the characteristic violaceous-blue colour, the wide black margin to the forewings, the marginal spots to the hindwing, and the shiny-white underside. But there is besides, in this, as in all the other Spanish races, considerable variation in the examples *inter se*, and, whilst the other characters are maintained, the size differs, the ♂ colour varies much in its tint of violet, the marginal spots of the hindwing are occasionally edged with rufous, and there is some difference in the width of the marginal border of the forewings, hence we find the race *hypochiona* splitting up into the following ♂ aberrational forms—ab. *lilacina-minor*, *rufolunulata-minor*, and a combination of the two in the *minor* form, *lilacina-rufolunulata*; the *lilacina* forms having the ground colour lilac instead of bright blue, and the *rufolunulata* with the two or three marginal spots on the hindwing near the anal angle with fulvous lunules. Oberthür notes (*Etudes*, v., p. 22) that, in Andalusia, in the neighbourhood of Granada (Alfakar), and above Lanjaron, towards the Picacho de Veleta, his brother took, in 1879, *hypochiona* in abundance; this is, he adds "a variety of *aegon*, and not, as Staudinger says, in his *Catalog* (1871), a variety of *argus*. The ♂ differs from our (French) type of *aegon* by the shining brilliancy of its blue above, and by the remarkable shiny whiteness of the underside; the ♀ s, usually brown above, are sometimes tinged with blue, the underside of a very lively pale yellowish-tawny, and the little marginal golden-blue points very accentuated." Again he writes (*Etudes*, xx., p. 28): "In the Sierra Nevada, and near Lanjaron, the form *hypochiona* is found; this form is remarkable for its great size, the shiny white colour of the underside of the hindwings in the ♂, the blue tinge, and the development of the orange marginal border above in certain ♀ s, and the light tawny tint beneath. It appears to be the southern race; one sometimes finds it in an attenuated form at Montpellier, Marseille, and Vernet-les-Bains." In the British Museum coll., under the name *hypochiona*, are two ♂ s, one ♀, "Sierra de Alfakar (Réné Oberthür), July, 1879;" one ♂, three ♀ s "Sierra de Alfakar (Ribbe);" one ♀, "Stispana (Leech coll.);" these ♂ s are fairly large, with well-marked margin to forewings, and discoidals to all wings, the hindwings with marginal dots; underside colour white, just a little paler than the examples from Gavarnie. The ♀ s of a brown ground colour, one with good orange bands on all the wings, with blue base to the forewings, and blue over the whole of the lower half of the hindwings, from base to orange lunules; two other ♀ s with strong bright orange bands on all wings; another ♀ with weak orange lunules on all the wings; one ♀ with only the barest traces of an orange border on inner edge of marginal spots on hindwings, which are, however, externally margined with white. The underside of the ♀ s, pale brownish; the spots well-developed, and a moderately marked submedian whitish band; in both sexes the orange of the underside of a pale tint, the metallic eyes well-developed. The other examples under this name in the British Museum coll., appear to be wrongly placed. Siépí says that the var. *hypochiona* is commoner and more widely distributed than the type in the Bouches-du-Rhône, at Plan d'Aups and Ste. Baume; it is also recorded from Sorède in the Pyrénées-Orientales by Sprüngerts, etc.

θ. var. *hypochiona-graeca*, n. var. *Hypochiona*, Staud., "Hor. Soc. Ent. Ross.," vii., p. 48 (1871). *Argus* var., Staud., "Cat.," 2nd ed., p. 10 (1871).—The majority of the specimens (Grecian) belong to the southern form described by Rambur as var. *hypochiona*, which is principally distinguished by the almost white colour of the underside. Further, the fringes of the ♂ s in var. *hypochiona* are entirely white, whilst in *argus* (*i.e.*, *argyrognomon*)[*] only the extreme tips are white. In the ♂ the black marginal spots of the hindwings are very sharply marked on the upperside, whilst the ♀ s have generally a well-defined, red, outer band, frequently with a whitish edge before the marginal line, which, strangely, is also found in the high northern specimens of *argus* (Staudinger, "Beitrag zur Lep. Griechenlands," *Hor. Soc. Ent. Ross.*, vii., p. 48).

At the time of describing these examples Staudinger erroneously referred them to *P. argyrognomon*, as also did he the Spanish examples of *hypochiona*, Rbr. But there are, in the Brit. Mus. coll., one ♂ and one ♀ of these 1867 captures, labelled "*argus* var. *hypochiona*, Schulz, 1869, Zell. coll.," the ♂ is further labelled by Zeller "Parnass, '67, Rb. Cat., p. 35." The ♂ is fairly large, the upperside not unlike that of *hypochiona*, with fairly wide margin on forewings, and marginal spots on hindwings. On the underside, however, the ♂ is much less white than are the undersides of the Alfakar *hypochiona*: it is, indeed, whitish-grey, less bluish-white than our southern British race, but nearer this than the white of the Alfakar examples. The ♀ paired off with it is (as also the one above, also labelled "Schulz, Zeller coll.") apparently *argyrognomon*. Perhaps this mixture of species in the Greek specimens, referred by Staudinger to *hypochiona*, explains Staudinger's erroneous reference of this name to *argus*=*argyrognomon*. As late as 1878, Staudinger was very weak on these species, for he writes (*Hor. Soc. Ent. Ross.*, xiv., p. 234): "The horny claw of the front tibia in many *aegon* is very rudimentary . . . . and I am doubtful whether *L. argus* and *L. aegon* have everywhere yet developed into two properly separated species, and hybrids between these very close species are not at all impossible." For two species so structurally unlike as these, such a remark from Staudinger is almost incomprehensible.

ι. ab. *bejarensis*, Chapm., "Proc. Ent. Soc. Lond.," p. xxxv (1902); "Ent. Rec.," xiv., p. 355 (1902); "Proc. Ent. Soc. Lond.," p. lxxxix (1906). *Argus* var., Chapman, "Ent. Rec.," xv., p. 72 (1903).—Taken

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[*] In this paper Staudinger uses the name *argus* for *argyrognomon*, and *aegon* for *argus*.

about 1½ miles east or south-east of Bejar, in west central Spain, on July 9th, 1902, and following days. Average size about 33mm. ♂, and 32mm. ♀. Some large specimens are 35mm., two dwarf specimens (the smallest of 100 taken) being 26mm. and 29mm. respectively. This form may be called *bejarensis*, and is characterised by its large size, 33mm.-35mm., by the definiteness of the black spots on the hind margin, often surrounded by a whitish suffusion, by the broadening of the black nerve-rays towards the dark border. The ♀ usually has the orange marks on the upperside right round all the wings, and their horseshoe form on the hindwings is often completed into a circle by a white or bluish line; in some specimens they are reduced to one or two on the hindwing only. The blue of the hindwing ♂ is often restricted as in typical *argus*, but oftener advances up to vein 7. The var. *hypochiona* is, perhaps, the nearest to this form. [It goes a good way towards bridging over the differences between *argus*, *lycidas*, and *zephyrus*, and in some degree *argyrognomon* also.] It resembles the latter in the extension of the blue of the hindwing of the ♂, and in the completed ocelli of the ♀ hindwing, but the colour of the underside of the ♂ and of the fringes of the ♀, are characteristic of *argus*, apart from the wide border and other obvious characters (Chapman).

The pick of Chapman's captures of this beautiful giant race have been placed at our disposal, and both sexes show considerable variation. On the whole they are considerably larger than the var. *casaicus*, and one suspects that the general tone of the ♂s, as a whole, is rather more lilac than that race; there is, however, considerable variation in this direction, and we have named the forms in our collection ab. *bejarensis-lilacina* (lilac ground colour), *lilacina-marginata* (with exceptionally broad band), ab. *bejarensis-intermedia* (between the lilac tint of *lilacina* and the bright blue of *bejarensis-typica*), ab. *metallica* (bright shiny metallic blue), and ab. *pallida* (pale metallic blue, reminding one something of the tint of the blue scales sometimes seen in ♂ *Cupido minimus*). The ♀s are also variable, the typical form having well-marked lunules on the hindwings, and poorly-marked on the forewings, ab. *bejarensis-virgata* with the orange well-developed into continuous bands on all the wings, and ab. *bejarensis-intermedia* with the lunules on all four wings well marked.

κ. ab. *casaicus*, Chapm., "Trans. Ent. Soc. Lond.," pp. 151, 158, pl. v., figs. 16-19 (1907). *Argus* var., Chapm., "Proc. Ent. Soc. Lond.," p. lxxxix (1906).—*Lycaena argus* was found at all the stations visited. At Vigo, the specimens were about 26mm. in expanse, of very ordinary facies, but presenting traces of the peculiar character, more marked in the Casayo specimens, yet to be referred to. Such small specimens only occurred at Brañuelas and Casayo as occasional aberrations. At these localities the form is a large one, up to 35mm. in expanse, of a very brilliant blue above, reminding one of *corydon* var. *corydonius*, and an uniform pale silvery tint below, fairly close to vars. *hypochiona* and *bejarensis*. It differs from these further by a very fair proportion of specimens having, on the hindmargin of the hindwing, two or three of the red arches that are present in the ♀; they are, however, not orange or red-brown as in the ♀, but modified by the blue so as to be a rosy pink. I believe such ♂ coloration is recorded in an Asiatic form that otherwise differs, and the faintest traces of it may be seen even in English specimens, if closely and sympathetically examined. I propose *casaicus* as a varietal name for the race (Chapman).

The species occurred throughout the different branches of the Casayo valley, the ground, chiefly steep and rocky slopes, clad with heath, *Cistus*, *Cytisus*, and often patches of scrub-oak, and in one or two places moister wooded slopes. Of the variation in the ground-colour Chapman notes (*Proc. Ent. Soc. Lond.*, 1906, p. lxxxix), that the "specimens varied *inter se*, some having the blue of a greenish tint, others full lilac." We have selected from Chapman's series of this insect some very beautiful specimens which vary considerably *inter se*, forming a series of aberrational forms parallel with, but excelling in intensity, those of var. *hypochiona* in our collection. There are, however, apparently no examples so small as those of our ab. *hypochiona-minor*. In colour, there are three marked ♂ forms—*lilacina* (of a full lilac tint), *casaicus* (bright blue), *metallica* (brilliant shiny blue), whilst of specimens showing the rufous lunules on hindwings, we have *lilacina-rufolunulata*, and *casaicus-rufolunulata*. The ♀ s are all well-marked with orange on the upperside, but, whilst the more typical form has the lunules separated and weakened towards the apex of forewings, the more brilliant ones, ab. *virgata*, have them united across all four wings into a well-marked band. Chapman notes (*Trans. Ent. Soc. Lond.*, 1907, p. 158) that "this variety differs from the vars. *hypochiona* and *bejarensis*, in that a very fair proportion of the specimens present two or three of the red of the marginal peacock eyes on the upper surface of the hindwings of the ♂ s." This, however, is only comparatively true, as some of the *hypochiona* from Canales show very distinct traces of the red lunules. In size, the largest compare favourably with the largest *bejarensis*, although the average is decidedly below that of the latter giant race.

λ. var. *brañuelasensis*, n. var.—In size and general appearance on the upperside, very like *hypochiona*, of a similar brilliant blue, the black margin on the forewings similarly broad and well-marked, but the spots on the hindwings almost hidden in the marginal border; the fringes of all the wings white. The essential difference is in the underside coloration; that of the forewings and base of the hindwings being distinctly grey instead of white, the latter colour being confined to the submarginal band on the hindwings; the spotting on the underside is well-developed, the orange submarginal band well-developed and of good tone. The only ♀ in our possession is of exceedingly rich coloration, the upperside warm brown with a brilliant orange submarginal band (*virgata*) on all four wings, and the fringes exceptionally dark; the underside of a most unusual brown tint, the spots black, edged slenderly with white; the orange submarginal band richly tinted and strongly developed; the white submedian band narrow but snowy-white; the marginal spots delicately edged externally on both wings with snow-white lunules, and usually three blue kernels well developed in the anal spots of the hindwing.

Among the ♂ s, three specimens are of the *rufolunulata* form, the lunules in one being strongly, in the two others more weakly, developed. Captured near Brañuelas, in Asturias, July, 1906.

μ. var. *vigensis*, n. var.—The ♂ s of a bright purplish-blue; the black marginal band of the forewings rather narrow, well-defined on the inner edge; the hindwings spotted marginally with black, the costa dark; the fringes of all the wings snowy-white. The underside grey-white, bluish at the base; the spots only moderately developed, black with white margins; the orange band well-defined on all wings, very brightly coloured on hindwings.

This race, taken in the neighbourhood of Vigo, is much smaller than the other Asturias' races, *casaicus* and *brañuelasensis*. The specimens have the same range of colour variation, some ♂ s being of a very bright blue, others of a more distinct lilac tint agreeing with ab. *lilacina* in this respect. Occasional ♂ specimens also exhibit well-defined orange lunules above the two anal marginal spots of the hindwing, thus forming an ab. *rufolunulata* of this *vigensis* race. The underside suggests distinctly a heath form, and is altogether wanting in the pure silvery-white colour that characterises *hypochiona*.

ν. var. *pyrenaica*, n. var.—A race of this species is found at Gavarnie and elsewhere in the Pyrenees, which is of little more than normal size, but which has the deep blue ground colour of *hypochiona*, the forewings with wide black margins, the marginal spots of the hindwings absorbed into the dark marginal border that surrounds these wings also; the fringes show very white in contrast with the black margin; the underside, however, is not of the white ground colour of *hypochiona*, but is grey, with a good deal of blue towards the base of the wings; the orange, too, is less brilliant, and often less in quantity. The ♀s are dark fuscous, with the orange lunules usually confined to three or four on hindwings, and the fringes grey except at the apices of forewings, which are white, whilst the underside is brown in tint, the orange well-marked, and there is a well-defined white subterminal band between the orange band and the submedian row of spots on the hindwings.

This gives one the idea of a highly-developed "heath" race, both in the ground colour of the underside, the intense markings of the upperside ♂, and the dark colour of the ♀s; in one of the latter there is no orange (=ab. *fuscus*), and in another the orange lunules in all the wings are well-marked (=ab. *croceo-lunulatus*).

ξ. ab. *hypochionoides*, n. ab.—This form occurs as an aberration among the var. *pyrenaica*, at Gavarnie. It is of a more lilac tint than the latter, has a narrower (but still well-developed) black margin to the forewings, is less suffused along the nervures, whilst marginal spots, as in *hypochiona*, replace the marginal band in the hindwings of *pyrenaica;* the fringes are white; the ground-colour of the undersides approaches, without attaining, the whiteness of *hypochiona*, and is not grey as in *pyrenaica*. It is of the size of *pyrenaica*, and smaller than well-developed specimens of *hypochiona*.

This is of the size, and very similar in general appearance to *hypochiona-minor*, but is wanting in the shiny white colour of the underside of the latter. The Vigo examples are very close to this race. It would appear to be the form Oberthür describes as occurring at Vernet-les-Bains.

ο. var. *sifanica*, Grum-Grsh., "Hor. Soc. Ent. Ross.," xxv., p. 450 (1891); Staud., "Cat.," 3rd ed., p. 78 (1901).—*Lycaena argus* var. *sifanica*. Varietas major, obscurior, limbo externo latissimo, puncto centrali distinctissimo. In montibus Dshachar detecta (Grum-Grshimailo).

Two of Grum-Grshimailo's original specimens (with special labels) are in the Brit. Mus. coll., labelled "Su-tcheou, Kansu. Gr.-Gr. 27. viii. 90." There is no doubt about these types being *argus* (*aegon*), but placed with them, by Elwes, is an example of *argyrognomon* labelled, "var. *aegidion*, Gr.-Gr., Amdo. Elwes coll.," so that this was possibly the origin of Elwes' idea, quoted by Staudinger "Cat.," 3rd ed., p. 78, that *sifanica* was, perhaps, *argyrognomon*, and probably also the cause of Staudinger's erroneously placing it as a var. of *argyrognomon*.

π. var. (*et* ab.) *ongodai*, n. var. *Aegon*, Elwes, "Trans. Ent. Soc. Lond.," p. 323 (1899 .—Of large size, ♂, ♀, 31mm.-33mm.; ♂ deep violet- rather than purplish-blue; outer marginal border strongly developed, nervures dark, fringes white; the discoidal lunules of all four wings exceptionally well-defined. ♀ deep fuscous-brown, the hindwings with well-marked orange marginal lunules, the forewings with faintly-marked lunules. In the Brit. Mus. coll., two ♂s and ♀s from "Ongodai, Altai Mts., 3000ft.-5000ft., June 18th-July 1st, 1898 (Jacobson);" one ♂ and two ♀s, "Ongodai, Altai Mts., 1898 (Berezowsky);" one ♂, "south-east Altai, Bashkaus, 3000ft.-4000ft., July 30th, 1898 (Elwes);" one ♂ (labelled *aegon*) "Samarkand, *ex* Staudinger (Godman-Salvin coll.)."

All the Ongodai examples are of this form, and the one Samarkand specimen. At Bashkaus, it apparently occurs as an aberration with a form very like examples in the British Museum coll., from Trafoi, Preth, etc. The *ongodai* ♂s are brighter and more violet-blue than the types of *sifanica*, which are more purple, and hence distinctly darker. Elwes writes (*Trans. Ent. Soc. Lond.*, 1899, p. 325):

"Common at Ongodai, and in the Tchuja[*] and Bashkaus valleys in July, 1898. Some of the specimens from Ongodai are very dark on the upperside, and might be considered as a small variety of *cleobis*, Brem., which is found in the Kentei mountains and in Mongolia, and of which I have specimens from Alphéraky, from Irkut, and from Uliassutai, under the name of var. *ida*, Staud., agreeing fairly with mine."

ρ. var. *micrargus*, Butl., "Cist. Entom.," ii., p. 283 (1875-1882); Leech, "Butts. of China," etc., ii., p. 301 (1893).—Above very like *L. argia* and *L. aegon;* lilac, with dentated blackish outer border, and snow-white fringes; below with the ground colour of *L. pylaon* (*triton* ?, Fab.); the markings exactly as in *L. argus*, excepting that the submarginal black spots of the secondaries have no trace of metallic colouring about them, and the orange belt connecting the two series of black spots is paler. Expanse of wings 1 inch 1 line. [Tokio, Japan.] As is the case with several of the Japanese moths, this species unites the characters of several European forms (Butler).

Butler's type is in the Brit. Mus. coll., labelled, "'78. 24 type." It is a ♂ in poor condition, quite characteristic *aegon* in its appearance, with moderately wide marginal border on forewings, and marginal spots only on hindwings. Elwes has placed another just like it, and also in poor condition, under the same name, the latter specimen labelled "Kisagawa, Central Japan, 1-3. viii. '04 (H. J. Elwes)." There are also two ♂ s and one ♀ placed here, labelled, "July 11th-12th, 1904, Asahigawa, Hokkaido (Elwes)," and one ♂ and two ♀ s labelled "July 2nd, 1904, Nikko (Elwes)." The difference in locality is considerable, and so is the difference in the appearance of these specimens. The upperside of the two ♂ s in the "Asahigawa" batch, is quite similar to the type-specimen of *micrargus*, with rather well-defined, but not wide marginal border on forewings, and marginal spots on hindwings. The "Nikko" ♂ is of quite a different facies, the margins broader-bordered and darker; the ♀ s also darker. This appears to us to be a "hill" form compared with the "Asahigawa" examples. The undersides of all three ♂ s and of the first-named ♀ without, the other two ♀ s with only a trace of, metallic scales on margin of hindwings. To us the "Nikko" examples appear quite near *pseudaegon*. Butler's remarks on the resemblance of *micrargus* to "*L. pylaon*, *argia*, and *argus*," and his statement that it "unites the characters of several European forms," are quite naïve. [Under this name elsewhere, and quite separate from Butler's type noted above, are erroneously placed, in the Brit. Mus. coll., four ♂ s and three ♀ s labelled "Japan, Pryer coll.," and nine ♂ s and three ♀ s "Gensan, Corea, June, 1886, Leech," of exceedingly large size, and hardly separable from the Spanish form *bejarensis*. These are our *coreana*.]

ς. var. *pseudaegon*, Butl., "Proc. Zool. Soc. Lond.," p. 851 (1881); Leech, "Butts. of China," ii., p. 301 (1893).—Nearest to *L. aegon* of Europe; the same colours. The ♂ smaller, with a very narrow, black, outer border to the wings; fringe narrower, submarginal black spots of secondaries rather smaller; female very faintly shot with steel-blue at the base of primaries; submarginal orange lunules obsolete; secondaries darker, purplish towards the base, bluish at the base; the whole of the black submarginal spots bounded internally by orange lunules, and externally by white ones. Undersurface greyer than in *L. aegon*, both sexes washed with pale greenish-blue at the base; black spots smaller, but arranged exactly in the same way; submarginal orange spots of the primaries of the ♂ extremely pale; those of the secondaries destitute of metallic spots in both sexes.

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[*] The Tchuja valley examples (from Elwes) in the Brit. Mus. coll., are *P. argyrognomon*.

Expanse of wings—♂ one inch two lines, ♀ one inch three lines. Iburi, Hokkaido, July. Coll. M. Fenton (Butler).

Under this name there are, in the Brit. Mus. coll., one ♂ and two ♀s labelled "Leech coll., Oiwake, 1885," and one ♂ "Leech coll., Gensan, Corea, June 1886 (Leech)." These are small, almost typical-looking European mountain examples, the ♂ hardly differentiable from those captured at Bergün, Trafoi, etc., but a little more purplish- a little less violet-blue; the discoidal lunule on all wings distinct; the ♀s almost without orange markings, almost as in the European mountain forms. One ♂ and two ♀s in Brit. Mus. coll., labelled "Nikko, July 2nd, 1904 (Elwes)," and placed as *micrargus*, evidently belong here (see p. 200).

τ. var. *coreana*, n. var.—♂. Of a deep purple-blue, with well-defined marginal border to the forewings, extending in some specimens in more, in others in less, conspicuously dark lines along the nervures; the hindwings with a weak band sometimes absorbing, more often not, the hind marginal spots, but continued broadly along the costa; the nervures also dark; the discoidals of all four wings traceable, but usually weak; the fringes white, basally shaded with grey, but on the hindwings with dark neurational marks extending halfway through, that is to the end of the grey area. The underside bluish-white, particularly blue at the base, the discoidal, basal, and submedian row of, spots well-defined, with white rings (whiter than the ground colour); the marginal spots on all four wings well-developed, the orange well-marked, especially on hindwings, and of good tone, the metallic kernels either absent or ill-developed. The ♀s fuscous-brown, the forewings almost unicolorous, with a fine white margin along the outer half of the costa, with hardly a trace of orange on the forewings, and then only as a faint band parallel to the hindmargin; the hindwings equally dusky or with bright orange lunules marking off the marginal spots of the ground colour; in one, these marginal spots are externally edged with white. The underside brown; the spots well- and clearly margined with white, the orange bands of all four wings not brighter than those of the ♂s; the pale subterminal band well-developed on hindwings only; the green metallic scales fairly developed in the Corean, but almost absent in the Japanese, examples in the Brit. Mus. coll. (One of the Corean examples has the ground colour of the underside of the forewings much suffused.) Fringes on the upperside much darker than in the ♂, in some quite dark grey, with white tips only, in others whiter on the outer half, and more nearly resembling those of the ♂. Four ♂s, three ♀s, Japan, Pryer coll.; nine ♂s, three ♀s, Gensan, Corea. Leech coll. Also "one ♂, one ♀, Assuma Yama, Japan, July 92 (Sansom)."

In the Brit. Mus. coll. there are, placed erroneously over the name var. *micrargus*, four ♂s and three ♀s of *coreana* labelled "Japan, Pryer coll." These are as large as the Spanish *bejarensis*, and very similar thereto, the ♂s with similar dark marginal borders and white fringes; ♀s with only the faintest traces of orange on the upperside, so as to be almost unicolorous, fringes fuscous, except the white apices. There are also nine ♂s and three ♀s labelled "Gensan, June 1886, Leech." These are even larger than the first-named examples; the orange lunules of the hindwings better developed, the fringes of one ♀ hardly so dark. Another ♀ with similar label, but "July 1886" instead of "June 1886," has whitish fringes throughout. These are no doubt the examples to which Leech refers (*Butts. China*, etc., ii., p. 301) in the statement "Corean specimens are usually much above the average size." This appears to be the race to which Oberthür refers (*Etudes*, xx., p. 29), when he states that, "in Japan, the type is larger than in Europe," which is by no means the case with all Japanese *argus*, *e.g.*, vars. *micrargus* and *pseudaegon*.

υ. var. *corsica*, Bellier, "Ann. Soc. Ent. Fr.," p. 615 (1862); Tutt, "Brit. Butts.," p. 183 (1896); Staud., "Cat.," 3rd ed., p. 78 (1901); Lamb., "Pap.

Belg.," p. 222 (1902); Fount., "Ent.," xl., p. 102 (1907); Tutt, "Ent. Rec.," xxi., p. 59 (1909). *Aegon* var., Obth., "Etudes," xxi., pp. 28-29 (1896).—This variety appears sufficiently remarkable to be described. The ♂ differs only from the ordinary type by its rather darker tint of blue, and by a rather wider white fringe; but the ♀ is always brown with the base and the disc of the four wings of a very brilliant blue, the fringe wide, of a yellowish-white, not chequered. It is the underside of this variety, and especially that of the ♀, however, that offers the chief character of this race. It recalls the modification that *Lycaena agestis* undergoes in the mountains of Scotland, a modification that has received the name of *artaxerxes*. The underside of the Corsican *aegon* is of an uniform grey-brown; the many discal spots are no longer black, but of a tint hardly darker than the ground colour, from which, however, they are clearly cut off by a white margin that encircles them. The discal spot of the forewing is much larger than in other races. The larva lives in June on a species of *Astragalus*. The imago is common in the mountains, where the plant, serving as food for the larva, grows in abundance. It occurs from the end of June until August, according to altitude (Bellier de la Chavignerie).

This is a very marked and special race. The upperside of the ♂ is only narrowly margined on the forewings with black, and on the hindwings with interneural spots, whilst the ♀ is, as noted above, strongly suffused with blue. On the underside, however, instead of the characteristic black spots, their position is clearly outlined with well-marked white rings enclosing merely rather large portions of the unmodified ground colour. Oberthür says (*Etudes*, xx., pp. 28-29) that "the Corsican race is very curious; above, the ♀ s are blue, as in *calliopis*, and below, the ordinary spots are brown, of the tint of *café-au-lait*, similar to the ground colour of the wing, instead of being black." Powell writes (*in litt.*): "Even in the freshest specimens the underside has a rather worn appearance, owing to the faded look of the spots, which are often not much darker than the ground colour, especially in the ♀ s, although always surrounded by white rings. The ♀ s are often much suffused with blue above, with the marginal row of orange crescents very feebly indicated or absent on the forewings, and rarely strongly marked on the hindwings; the crescents are frequently suffused and swallowed up by the broad black margins. This variety was in great abundance on the top of the Col de Scalella, between Bastelica and Bocognano, alt. 1173m., July 13th-24th, 1905, on rough pasture land with short grass, dwarf juniper bushes, low-growing thistles with large flowers, and a sort of lemon-thyme, the flowers of which are very attractive to this 'blue.' The insect occurs only a few mètres below the summit of the Col, north or south; the chestnut forest begins a little below the Col on the north side, and the variety occurs in diminishing numbers down to the first trees; on the south side it is much scarcer, and one sees no more of it as soon as the bracken and heather become abundant. Here it is replaced by the scarcer, but more widely distributed, Corsican form of *P. argyrognomon*, which is to be had all over the Bastelica region." *P. argus* var. *corsica*, is also found on the Vizzavona Pass. Miss Fountaine notes (*Ent.*, xl., p. 102) that the var. *corsica* was only taken in 1906, on the very top of the Col de Vergio, about 5000ft., in July, where it was extremely plentiful. Actual specimens of this form in the Brit. Mus. coll., are noted as having been taken between June 22nd-July 21st, 1893, at La Foce, June 15th, 1893, at Tattone (Yerbury).

φ. var. *masseyi*, Tutt, "Ent. Rec.," xxi., p. 58 (1909). *Corsica*, Massey, "Ent. Rec.," vii., pp. 127 *et seq.* (1895); Murray, "Ent. Rec.," ix., p. 294 (1897).—♂ s varying in colour from those having a distinct *argus* (*aegon*) tint (with just a trace of red in it), to the blue which characterises *argyrognomon*. The dark marginal border is narrow, and, in some specimens, restricted to a fine line, with dark nervures showing on the outside of the wing. The hindwings in all the specimens present a more or less complete row of marginal black dots, separated by the fine black nervures, and, in some specimens, edged externally with paler—one specimen shows a pale coloration along the costa, and at the upper part of the outer margin of the hindwing. The undersides of the forewings of the ♂s may be described as pale grey with blue bases, with but little orange on the marginal border, and with slight variation in the size of the spots forming the transverse angulated row crossing the forewings. The hindwings are characterised by a white band between the marginal row of orange spots and the transverse row of black spots, the latter of which in the antepenultimate spot shows some tendency to vary, in some specimens being much higher than, in others more in a line with, the remainder. The upperside of the ♀s is most remarkable, the forewings being blue at the base, the colour extending to the centre of the wing, and reappearing again as a transverse shade reaching from the costa to the inner margin, leaving the broad brown outer marginal band, which is so characteristic of the ♂ *P. argus* (*aegon*). Faint traces of orange spots are sometimes present in this outer marginal band. The hindwings are shaded entirely with blue, which is of two tints, as in the ♂s, the more purple *argus* (*aegon*) tint and the bluer *argyrognomon* tint, the latter very bright and characteristic; a series of marginal spots is present in all the specimens, but the quantity of orange present is distinctly limited. The undersides of the ♀s are characterised by the distinct white band which traverses all the wings between the orange marginal band and the transverse row of black spots, and also by the strong development of the silver studs in the orange bands. There is also some variation in the transverse band of spots on the hindwings, the antepenultimate spot being well raised out of the level of the others (an *argus* character) in some specimens, whilst it is almost in a line with the other spots (an *argyrognomon* character) in other specimens. In colour the undersides are pale grey with a brownish tinge, but with scarcely a trace of greenish-blue at the base (completely absent in some) (Massey).

Owing largely to our suggestion, this race was first described by Massey as var. *corsica*, a race very similar on the upperside, very dissimilar on the underside. The race occurs on the "mosses" that are found on the Westmorland and Lancashire borders, and is to be captured in both counties. Massey says that the insects occur only in the wettest part of the "mosses," are extremely local, and fly very little; he has found them only on very limited parts of the mosses, but as there is an enormous tract of country similar to that in which the insect occurs, it is possible that it is really widely distributed there. It was first recorded from these mosses by Hodgkinson, who captured it at Witherslack, on July 21st, 1856, and then in profusion on July 14th-15th, 1861, at Whitbarrow Scar; then it seems to have been overlooked till taken in the Witherslack Mosses by Massey, on August 1st, 1892, July 14th, 1893, July 20th, 1894, and July 14th, 1895. Crabtree took it in fine condition, on July 17th-18th, 1897, July 29th, 1898 (♂s only, a late season, and not fully out), July 20th, 1902, (♂s only, and these only just commencing to emerge), and on July 20th-21st, 1906. Murray notes that, in 1897, he found them flying among a very low species of rush about 3ins. high, in a place where trefoil does not seem to occur. Massey says that, he has never seen a ♀ of the uniform brown shade, usually characteristic of the south of England specimens; it is quite unknown on what the larvæ feed in the Witherslack district, but there is an abundance of *Ornithopus perpusillus* on the mosses.

χ. var. *cretaceus*, Tutt, "Ent. Rec.," xxi., pp. 58-59 (1909). *Ægon*, Barr., "Lep. Br. Isl.," pl. xi., fig. 1 (1893). *Hypochiona*, Jones, "Ent. Mo. Mag.," xli., p. 254 (1905); "Proc. Ent. Soc. Lond.," p. xlvi (1905).—♂. Bright blue, dark margin of forewings narrow or absent (sometimes quite pallid), discoidal lunule obsolete, on hindwings; interneural marginal spots replace usual band; underside bluish-grey, spots clearly defined. ♀, dark fuscous, often tinged with blue, orange marginal lunules on hindwings poorly developed, on forewings usually obsolete; underside pale brownish, with well-defined spots, and whitish submarginal border.

This is the form that we noted (*British Butterflies*, p. 183) as "occurring near Dover and in other chalky districts, the ground colour of the ♂s much paler in tint than those from heathy localities, and the dark margin practically obsolete." It is the common form found on the open downs of southern England, and has a wide distribution on the Continent. It is most closely allied to *aegiades*, Gerh. (*anteà* p. 192), but has well-developed metallic kernels on the underside of the hindwing, and is also very similar in its general characters to the specimens of var. *orientalis* in the British Museum coll. (*anteà* pp. 192-193).

Pathological examples.—The presence of pallid patches on the wings, otherwise well-scaled, indicating failure of scaling or pigment, or both, in limited areas, is of frequent occurrence in this species, but very few appear to have been described. The following are a few examples that have been described or otherwise come under our notice:—

α. ♂.—The left pair of wings well-developed as to size, and matching the right pair in this respect, but both left fore- and hindwing with a largish pallid whitish discal patch. Corsica, July 1906 (Tutt coll.).

β. ♂.—The left forewing with the space between the discoidal and apex, and the left hindwing just inside the dark margin, each with a pallid, unpigmented patch, the right forewing with a snow-white fold on the middle of the costa, making a slightly concave hollow. St. Michel de Maurienne, July 30th, 1896 (Tutt coll.).

γ. ♂.—The whole of the hindwings from the marginal border to the base, pale, most markedly unpigmented nearest the border; on each of the forewings a pallid patch between the margin and the discal lunule, similar to those on the hindwings. [The specimen has somewhat the appearance of some pale ♀s of the tropical forms of *Celastrina argiolus*.] Captured at Dover, July 1898 (Tutt coll.) = ab. *pallida*.

δ. ♂.—Very pale in colour, almost mauve. Captured at Dover, 1887 (*Ent.*, xxi., p. 133) (Webb coll.).

ε. ♂.—The left forewing with a large spot of vague outline, of a greyish-white colour, occupying all the subapical area, and leaving intact the black margin, and, on the left hindwing, a spot of the same colour which occupies a space equivalent to a quarter between the discoidal cell and the black margin. Captured at Binn, in the Valais (Blachier coll.).

ζ. ♂.—The forewings, from the base to about one-third along the costal margin, and inner margin normal; from here the colour is of a pale bluish-grey, somewhat the colour of *Agriades coridon*, only paler; the hindwings are much the same as the forewings, but the seven crescentic marginal spots show on the upperside very distinctly as in the ♀; on the underside the spots are mostly very indistinct, especially on the forewings. Captured at Gaddon Down near Cullompton (Angus, *Ent. Rec.*, xiv., p. 247).

η. ♀.—Fully scaled, but with the usual brown wing-pigment absent from a space triangular in shape on all the wings; on the forewings the base of the triangle extends from the anterior angle, to the 3rd median nervule, and the apex reaches to the discoidal spot; within this space all the usual orange marks are absent. On the hindwings the base of the triangle extends from the second median nervule to the second subcostal nervule, and the apex of the triangle reaches the discoidal spot. Captured at Dunyeates Hill, near Poole, June 1893 (Curtis, *Ent.*, xxxi., p. 66).

θ. ♀.—The tips of all the wings bleached (Webb, *Ent.*, xxi., p. 133).

ι. ♀.—The upper surface of all the wings of a pale fulvous-tawny, the exact colour of that of *Hipparchia pamphilus*. In Hatchett's coll. (Stephens, *Illus. Haust.*, i., p. 94) = ab. *fulvescens*, n. ab.

PLATE XXIII.

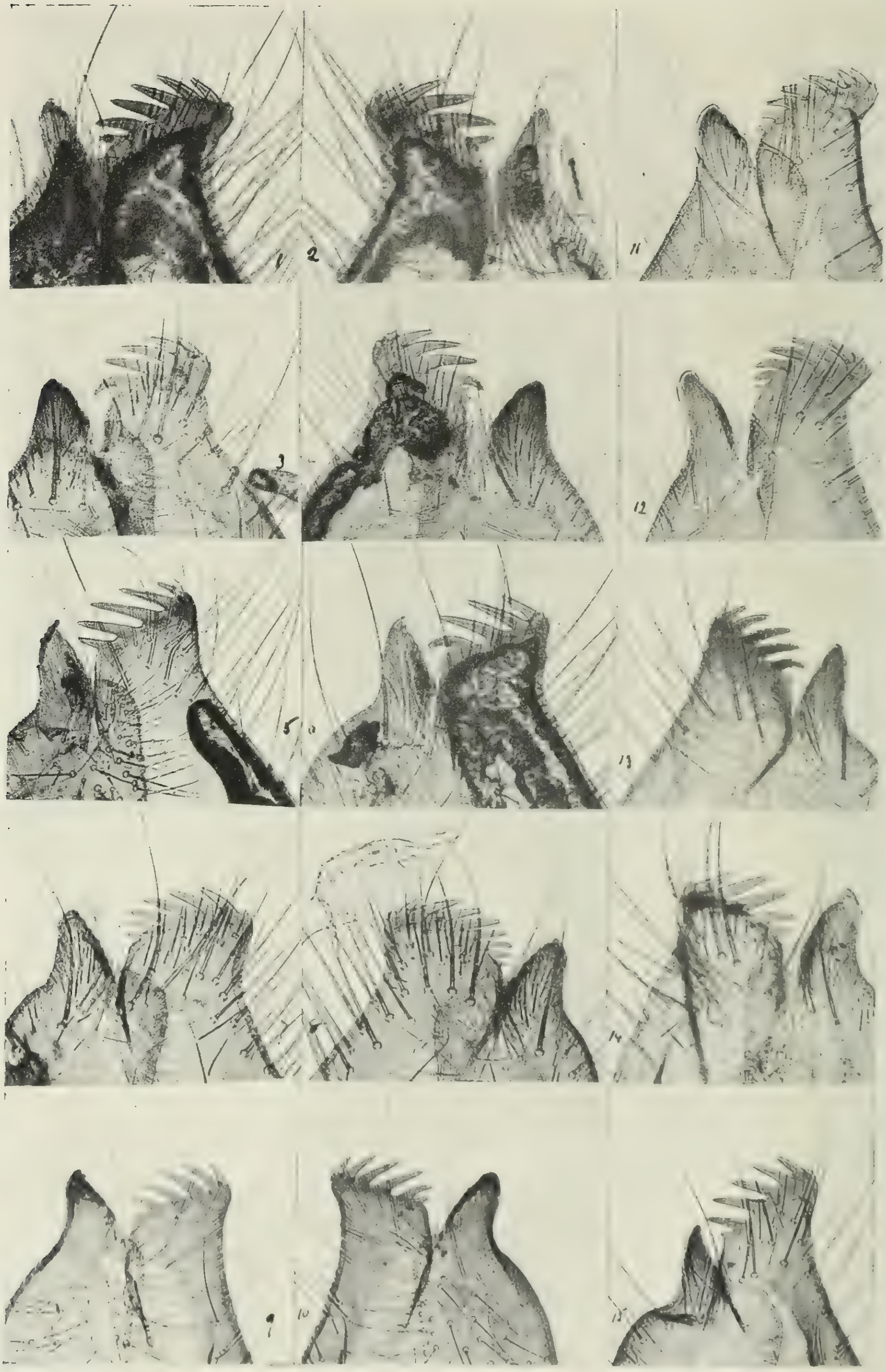
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Photo. F. N. Clark.

VARIATION IN THE MALE GENITALIC CLASPS OF PLEBEIUS ARGUS (ÆGON).

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[*To face p. 205.*]

κ. ♀.—Pale yellow in ground colour. Exhibited at the meeting of the Sth. Lond. Entom. Soc., held on April 14th, 1887 (Briggs).

λ.-μ. Two ♀ s.—Of a very light brown tint. Captured Dover, 1887 (Webb, *Ent.*, xxi., p. 133; Barrett, *Brit. Lep.*, i., p. 76).

ν. ♀.—Ground colour above ochreous-yellow, shot with shiny grey; the orange also, and the whole underside very pale, as if much faded, with the same silky glaze as the upperside. A kind of albino from Sarepta (Nolcken, *Lep. Fn. Estl.*, p. 54).

ξ. ♂.—The outer third of the forewing, and four-fifths of the hindwing with the blue colour transformed to a rather dead but lustrous grey colour. Bérisal, July 3rd, 1906 (Prideaux coll.).

ο. ♂.—The usual blue tint entirely replaced by a faint but lustrous mauve-pink; all the wings appear to be rather thinly-scaled and diaphanous. Bérisal, July 17th, 1908 (Prideaux coll.).

Teratological examples.—One suspects that teratological examples are not so rare as the records might lead one to suppose. We have noted:—

α. ♀.—Right hindwing about two-thirds the natural size, short and broad, the black spots before the orange series reduced to three medial and three postmedial spots. Ventnor, August, 1883 (Hampson, *Ent. Mo. Mag*,, xxxvii., p. 120).

β. ♂.—The right pair of wings normal and well developed, left pair, both fore- and hindwing shorter and narrower than the corresponding one on the right, presenting a marked difference in size. Lavin, August 9th, 1908 (Tutt coll.).

γ. ♂.—The wings all shortened, the forewings also broadened, the left forewing more normal, the right forewing rounded on the outer margin; the hindwings narrowed, the apex pointed, and the outer margin straight between the apex and the anal angle. Captured at Simplon, July 1899 (Tutt coll.).

δ. ♂.—The right forewing hollowed out on the inner margin; the right hindwing shortened and narrowed, so that the wing is much smaller than the corresponding left wing. Captured at Cuxton, June 29th, 1896 (Tutt coll.).

ε. ♂.—Right side both wings normal in shape and size; on the left side the hindwing slightly narrower than the right, and the left forewing, though uninjured, is much reduced in size, and presents a shrivelled appearance, but the discoidal spot is in its right proportional place (as compared with the right wing); the whole wing is, however, narrowed to a short strap, with a slightly concave outer margin. The dashes that are the equivalents of the marginal spots on the right wing are absent on the left one. Captured at Bérisal, June 29th, 1906 (Prideaux) = ab. *cuneata* (*anteà* p. 186).

ζ. ♂.—The tarsus divided into three joints instead of all the joints and terminal claw being fused together without trace of articulation. Spain (Chapman, *Proc. Ent. Soc. Lond.*, 1909).

Genitalic variation.—The ends of the clasps of *Plebeius argus* and *P. argyrognomon* are very different; the former with a few long teeth rather on the side of the hard process (see *anteà* p. 155), the latter with a number of very fine teeth on the rather broad end of the process. But the comb-like end of the clasp of *P. argus* presents a great (and most unusual) range of variation, the total number of teeth varying within considerable limits, and the presence or absence of one or several minor or ill-developed teeth at either end of the series, is another point in which there is great inequality in different specimens. We find even the opposite clasps of one individual differing very frequently, and a different number of teeth to the comb may be found in specimens from one locality (Chapman).

Comparison of the males of Plebeius argus and P. argyrognomon*.—The confusion of the names of these species has lasted considerably over a century, and we are now, 134 years later, using

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* Comparison largely made between specimens captured on the same ground near Simplon village, August 4th, 1899 (see *Ent. Rec.*, xii., pp. 38-39).

the name *argus* differently from the way in which it was used by Schiffermüller. But the difficulty of separating the species has also proved troublesome, although, except in some individual cases, the difficulty is not as a rule great, and mistakes are rather the result of hurry or want of training than anything else, and one can usually discriminate the ♂ s at a glance. It is difficult, however, to define by words the differences we see. In colour *P. argus* (*aegon*) is more violet- or purplish-blue, *i.e.*, has a more pronounced tinge of reddish in its tone, the apex of the forewings is rather rounder, the outer margin also rounded, the costa of the forewings more broadly white, the dark marginal border wider and more decided; the hindwings have a very black costal margin (to second nervure, *i.e.*, to second branch of subcostal nervure), extending to the outer margin; those of *argyrognomon* are only dark to the first branch; the dark margin of the hindwings also is more pronounced in *argus*, whilst, in *argyrognomon*, the margin is represented rather as interneural spots; in all the wings the fringes of *argyrognomon* usually appear quite dull grey compared with the snowy-white (externally) fringes of *argus*. On the undersides the ground colour of *argus* is bright silvery-grey (tending sometimes to whiter, at others to greyer than normal) with bright blue bases to all the wings; in *argyrognomon* the ground colour is dull grey (almost with a tinge of ochreous), and the base of the forewings is only slightly, of the hindwings more strongly, sprinkled with greenish-blue; sometimes the ground colour of *argus* has a tinge of red in it, but the more variegated appearance of the underside of *argus* as a whole is usually very marked when compared with the uniform sameness of that of *argyrognomon*; the spots of the angulated row on the underside of the forewings are larger, more conspicuously and more strongly ringed with white, in *argus*, whilst the direction is different, there being a much stronger angulation in *argus* centrally; the discoidal spot also is much nearer this row in *argus*. On the hindwings, again, the black spots are more conspicuous, comparatively large, and more strongly ringed with white, and again the spots run up nearer the discoidal. The marginal orange spots incline rather to red-orange in *argus*, to yellow in *argyrognomon*; the metallic scales in these marginal orange (yellow) spots are often much brighter and of a more brilliant blue in *argus* than in *argyrognomon*, where they are inclined to greenish. The tips of the palpi appear to have a black pointed terminal spine in *argyrognomon*, but are more slender, black with a white terminal point, in *argus*. The eyes of *argus* are surrounded with blue-white scales, those of *argyrognomon* with white scales. The tips of the antennæ of *argus* are strongly marked with brown beneath; the long, black, antennal segments, and white intersegmental rings appear also to be much more sharply marked in *argus* than in *argyrognomon*. Apart from these differences, four structural characters are absolute, *viz.*, (1) the presence of a well-developed spine on the front tibia of *argus* (*aegon*), and its absence in *argyrognomon*. (2) The great difference in the ♂ genitalia is remarkable; Chapman notes it as almost greater than that between any other two Plebeiids (see *anteà* pp. 155-6). (3) The androconia of *argus* are somewhat elongate, crossed by eight to nine longitudinal rows of points fairly separate; those of *argyrognomon* are almost circular, with ten to twelve longitudinal rows of points. (4) The conspicuous white hair-scales, so abundant in *argyrognomon*, are

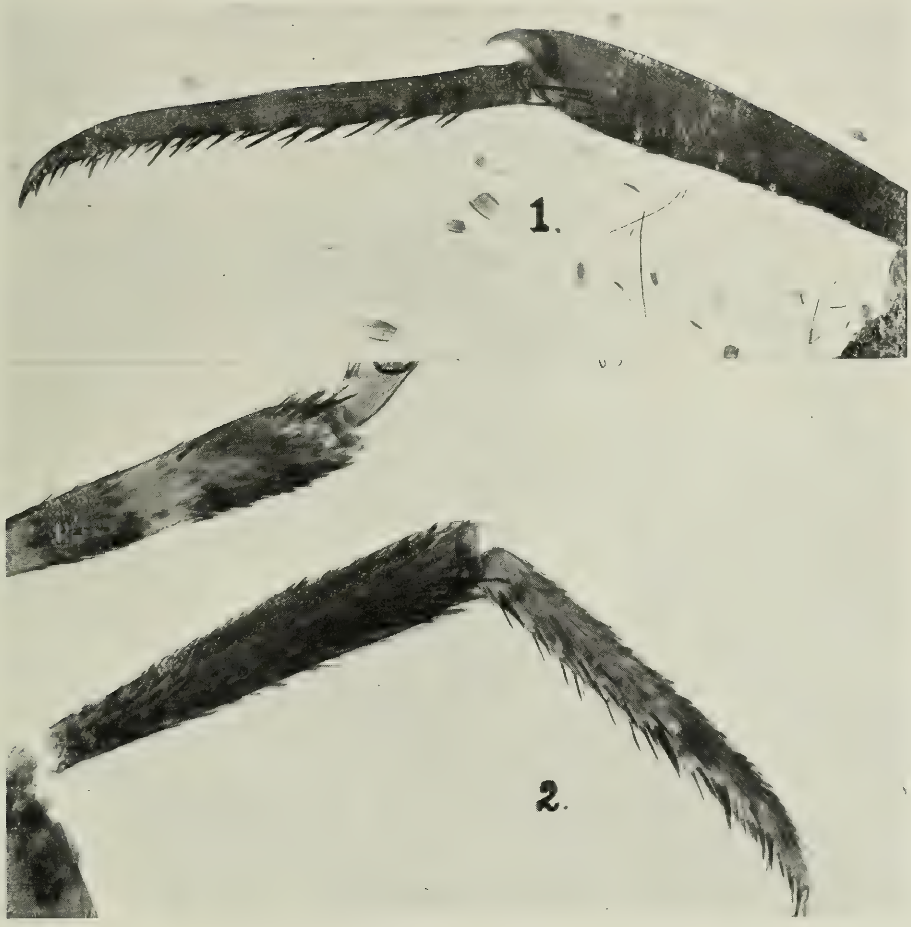

Photo. F. N. Clark.

COMPARATIVE VIEW OF FRONT LEG OF ♂ OF PLEBEIUS ARGUS AND OF P. ARGYROGNOMON × 35.

1. PLEBEIUS ARGUS (SHOWING TIBIAL SPINE). 2. PLEBEIUS ARGYROGNOMON.

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[*To face p.* 206.]

wanting in *argus*. Oberthür observes (*Etudes*, etc., v., p. 21) that *Plebeius argus* (*aegon*) " varies greatly in different localities, as also does its congener *P. argyrognomon*, from which it is sometimes difficult to distinguish it with certainty. In Brittany, *argus* (*aegon*) is very large, and its size often surpasses that of *argyrognomon*, but the two species differ greatly in the shade of blue in the ♂, being always more violet in *argyrognomon*, and in the tint of the underside of the wings, grey-white in *argus*, darker (brown) in *argyrognomon*; further, the latter always emerges one or two weeks earlier than *argus*, and is *passé* when *argus* is quite fresh. At Zermatt, *argus* is very small, and the ♂ has the wings margined with a very wide blackish border. In the Pyrénées-Orientales at Vernet, *argus* ♂ is large, pale, less widely-bordered with black, and the marginal dots of the hindwing are very pronounced" (=*hypochionoides*, *anteà* p. 199). "At Cannes, the type appears to be smaller, and if one may judge by captures made in June 1876, the ♂ tends to be of a very pale blue, with a slightly greenish tinge. At Madrid, the type of *argus* differs little from that of Vernet. In Dauphiny, near Uriage, a very large form of *argyrognomon* is found, of which the ♀ is sprinkled with blue scales on the underside, and a form of *argus* very similar to that of Brittany, flying at nearly 900 mètres altitude; further, one finds in a southern locality, on the road from Grenoble, a species of which the ♀ is as widely blue above as *ceronus*; this species, which Boisduval called *acreon*, Fab., in his collection, and treated as a variety of *argyrognomon* in the *Index Methodicus*, 1840, p. 11*, is very distinct in the flax-grey tint of its wings beneath, and the reduction, and even obliteration, of the black spots, particularly those of the median part of the wings. In Andalusia, near Granada (Alfakar), and above Lanjaron, towards the Picacho de Veleta, Mr. R. Oberthür captured, in 1879, in abundance, *hypochiona*, Ramb., which is to be regarded as a variety of *argus*, although Staudinger, in his *Catalog*, 1871, p. 10, treats it as a variety of *argyrognomon*; this butterfly differs from the French form of *argus*, by the brilliant sheen of the blue of the upperside, and the remarkably bright white of the underside, of the wings in the ♂; the ♀, generally brown above, but sometimes strewn with blue scales, is below of a clear yellowish-tawny, very bright, and the marginal golden-blue points are very accentuated. In the same locality, *argyrognomon* is to be found, differing from ♂ *argus*, by the underside of the wings being of a grey-brown, and approaching greatly to the French form. This colour of the underside of the wings in the ♂, appears to me significant, although certain examples of both species are sometimes sufficiently intermediate to be embarrassing, but, in the immense majority of cases, it is a very certain guide, and it is largely on this account that I refer to *argus* (*aegon*) the Lycænid from Askold; above, it differs little from *argyrognomon*, the colour of the ♂ is of a darker blue, the margin of the wings is very narrowly black, but beneath, the tint of the ♂ is of a whitish-grey, that of the ♀ from Askold is not even so brown as that of the ♂ *argyrognomon* of France. However, the underside of the ♀ *argus* is known to come somewhat near the tint of ♂ *argyrognomon*. David has taken, in the north of China, a form of *argus* similar to that from Askold, but smaller." Later, in *Etudes*, viii., p. 15, Oberthür adds: " The two species are found at Cauterets. Staudinger seems to me to be wrong in making *hypochiona*, Ramb., diagnosed as 'major subtus albicans,' a variety of *argyrognomon; hypochiona* is certainly an Andalusian form of *argus* (*aegon*), and not of *argyrognomon*. In the same *Catalog*, p. 10, Staudinger makes another error, in uniting *calliopis*, Bdv., with *argyrognomon ;* the former is a very distinct species from Dauphiny; the ♀ is not only 'cærulescens,' certain ♀ *argyrognomon* also are that, but the two sexes are very distinct by the '*gris de lin*' colour of all four wings beneath, and the extraordinary tendency to obsolescence in the black spots." Yet again, Oberthür returns (*Etudes*, xx., 1896, pp. 26-28) to these species. After giving a clear *resumé* of the facts relating to *argyrognomon* and its variation, he observes that "the small Lapland race differs scarcely from that of the Riffel-Alp, known as *aegidion*, Meissner," etc. This latter name, as has already been shown (p. 191), does not belong to *argyrognomon*, but to *argus* (*aegon*), and it may be noted that the Lapland race of *argyrognomon* = *lapponica*, Gerh., and the mountain-form = *alpina*, Berce, of the same species, are not particularly alike, the ♀ *lapponica* being, as a rule, much more suffused with blue. Oberthür then states that Staudinger "is mistaken in referring *bella*, H.-Sch., to *argus* (*aegon*) as a variety," as specimens sent to him as "*bella*, from the Taurus (Barud-Dagh), belong to *argyrognomon*, and come very near the Pyrenean race of this species." Here, no doubt, Oberthür is himself mistaken ; we have already given (*anteà*, p. 187) our reasons for believing *bella*, H.-Sch., to be a form of *argus* (*aegon*). Oberthür then adds that "*argyrognomon* from China, Manchuria, and Japan, is larger than in Europe, the ♀ has the tawny spots much better marked above, and more striking on the hindwings ; in both sexes, the black spots are thicker on the underside, the ground colour brighter, and its tint, in the ♂, more grey and less brown." This is so, the Japanese specimens of *P. argyrognomon* being sometimes as large as *P. argus* var. *coreana*. "At Marseille, Digne, Barcelonette, and Vichy, *argyrognomon* has a ♀, sometimes tinted with blue as in the ab. *ceronus* of *A. bellargus*, of which the underside approaches the form from the Pyrenees, being greyer and bluer, particularly at Vichy. The race from Marseille, from the Basses-Alpes, and from the Allier, evidently leans to *calliopis*, Bdv. (*Icones*, pl. xv., ♀, figs. 4-5), first taken by Boisduval at Grenoble." He again says that he believes that *calliopis* is a distinct species, but is less assertive than in his preceding statement concerning this insect (*suprà*).

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* Referred to *infrà* p. 208, as *calliopis*, Bdv. (*Icones*, p. 58).

Egglaying.—The eggs are deposited singly, and adhere firmly to the object on which they are laid in July and August (Frohawk), *e.g.*, the stems of *Erica cinerea*, June 15th, 1900 (Prideaux); furze, July 24th, 1906 (Rayward), etc. In confinement, ♀ s laid with great reluctance on *Lotus corniculatus*, and almost more freely on the side of a tin box, about August 6th, 1907 ; on August 24th, the young larvæ were found fully developed within the egg, but did not commence to hatch till February 22nd, 1908 (Chapman). Three ♀ s, sleeved on heath and *Lotus corniculatus*, deposited, on July 20th, 1905, twenty ova, nineteen on the heath, and one on *Lotus corniculatus ;* on July 23rd, 1905, six other ♀ s only deposited two ova between them, on heath. These eggs remained as such till March 10th, 1906 (when one hatched), another March 11th, three on the 14th, one on the 16th, one on the 20th, two on the 23rd, one on the 24th, and the last on the

25th, but all had died by March 30th (Wood). Rayward states that, in confinement, ♀ s laid ova profusely all over the bunch of furze given them, as well as sparingly on the muslin covering of the cage, none low down; Newman states that, in captivity, the ♀ s he has kept for eggs, laid most freely, thrusting their ova into the cracks of a box, whilst, if given muslin two or three times folded, they thrust the ova between the folds. It would appear that they prefer to lay on comparatively dry materials, and not on leaves. The fact, however, seems to remain, that there is practically nothing known of the egg-laying of this species in nature, although Torka records (*Zeits. Natur. Ver. Posen*, 1905, p. 8) that, on July 17th, 1905, he observed a ♀ lay a bluish-green egg near a bud, in the hollow channel of a new shoot of *Sarothamnus scoparius*, about 1 p.m. The egg-stage lasts from June, July, or August, until the last week in February, or the first week in March, those noted above as laid on *Lotus corniculatus* commenced to hatch, as already stated, about February 22nd, when two young larvæ were observed, and two dead ones; brought into a warm room, six or eight more hatched within a few hours; on February 23rd, another dozen hatched (Chapman).

Ovum.—The egg is very like the wintering egg of *Agriades coridon*, in having a very flat top and bottom, and the sides rounded, of course, but still more nearly perpendicular than that description might suggest. It is 0·66mm. across, and, of this, the flat top and bottom are 0·57mm. and 0·60mm., the bulge being only the difference, *viz.*, 0·09mm. to 0·06mm. This is to the outside of the projections of the white coating, not the true egg simply. Like the egg of *A. coridon*, the top is flat by the failing of the pillars at the angles of the network, but the area over which they are wanting is only 0·42mm. across, the pillars outside this only reach to the same level, so that the egg below must decline a little, though the visible surface is quite plane. The micropylar depression (*i.e.*, the minute central circle without adventitious coat) is 0·06mm. across. It is, in fact, hardly a depression, but it is surrounded by a definite margin of white material; it is a little irregular in its margin, but may be described as consisting of four circles of cells, that is eight cells across the 0·06mm. just noted, or each cell about 0·008mm. in diameter; they are like circular cells, the outer circle laid down first, the next above it, and so on, so that each cell has the outer margin circular, the inner angular, and the circular portions of the inner margins concave; the inner cells are smaller, and are five or six in number, and somewhat pear-shaped; no micropylar openings are detected. The irregularity consists in the rows or circles of cells being fewer on one side than another. The cells of the top, outside the micropylar area, are not so sharply divided, as in *A. coridon*, into an inner (0·42mm. across, as noted above) set without columns at angles, and an outer with them, but they show no certain definite transition, so that the measurement given (0·42mm.) must be taken as only approximate, since it assumes a special line where there is none, and which one may locate differently on different views; still something like a central area of 0·33mm. is without columns, whilst at 0·50mm. they are well-marked. The cells themselves get gradually larger from the centre outward—0·015mm. next the micropylar area, to 0·05mm. at the margin and sides. They have an irregular, engine-turned pattern, but so far broken that the cells are hexagons rather than rhomboids, and have curved sides. On the outer margins, the cells are regular triangles arrayed in hexagonal order, and some 0·05mm. in diameter; at the margins and sides the columns are pyramidal, with about six ridges of the converging cell-walls running up them, the tip being rather blunt (Chapman). Of a very compressed spherical form, its greatest diameter measuring ·625mm., but only ·31mm. in height. The base is slightly concave, the crown being more so, and the operculum (micropylar area) deeply sunken, and very finely punctured; the punctures are smallest in the centre, increasing in size on nearing the side, where they develop into a very beautifully-formed pattern, resembling fine lace-work, composed of a number of prominences placed at somewhat regular intervals, and connected one with another by six keels or spokes, the interstices between each being very deep, the reticulations again lessening in size on nearing the undersurface, which is likewise deeply punctured, and of a spongy character. Both the colour and texture greatly resemble white porcelain; all the depths produce a deep purplish-grey shade (Frohawk). White in colour, of a circular form, flattened and depressed in the centre, both above and below, covered with raised white reticulation, except at the top. It does not change colour, but retains its pure dead-white appearance, even after the exit of the larva (Buckler). The egg is figured by Clark (*Ent. Rec.*, xii., pl. xi., fig. 5), also by Tonge, see our pl. i., fig. 5.

HABITS OF LARVA.—The larva makes its exit by eating away a small round hole in the crown of the egg, which has the appearance of a small black dot; placed inside the expanding flowers of *Ulex europaeus*, the young larvæ were noticed soon afterwards feeding on the tender portions of the stamens and petals (Frohawk); placed on growing plants of *Ornithopus perpusillus* and *Erica tetralix*, they appeared to wander off and perish; but placed in test-tubes on *Ornithopus perpusillus*, they appeared to do fairly well, but took almost three weeks to become fullfed in the first instar; at first they were able to drop by a thread, and, in moving about, appeared to spin for themselves a silken ladder as a foothold (Chapman). Some newly-hatched larvæ, placed by Buckler on *Ornithopus perpusillus*, fed on the leaflets, making small transparent blotches thereon, and continued so to do in their later instars, although, even when from ·25ins. to ·375ins. in length, they did not eat through the leaflets, but only devoured the green cuticle. In the second stadium, those fed on *Ulex europaeus* still devoured only the stamens and pistils of the flowers, some of the blossoms having the petals thickly perforated by them (Frohawk); those living on the leaves of *Ornithopus perpusillus*, are stated to have closely resembled, in their younger stages, the hairy leaflets on which they fed; whilst those on gorse-blossom are said, when young, to be very similar in form and colour to the small brown bracts of the bloom. These latter larvæ continued to feed thereon as long as the gorse remained in bloom, and when the gorse-blossom failed, took readily to the young and tender spines. The young larva is noted by Buckler to have powers of locomotion of the feeblest description, whilst Frohawk records the larva throughout life as being extremely sluggish in its movements, with a slow gliding motion, continually protruding and withdrawing its head, and waving it from side to side during its progression, but when at rest its head completely withdrawn under the large overlapping prothorax. The larvæ vary considerably in their

PLATE LI.

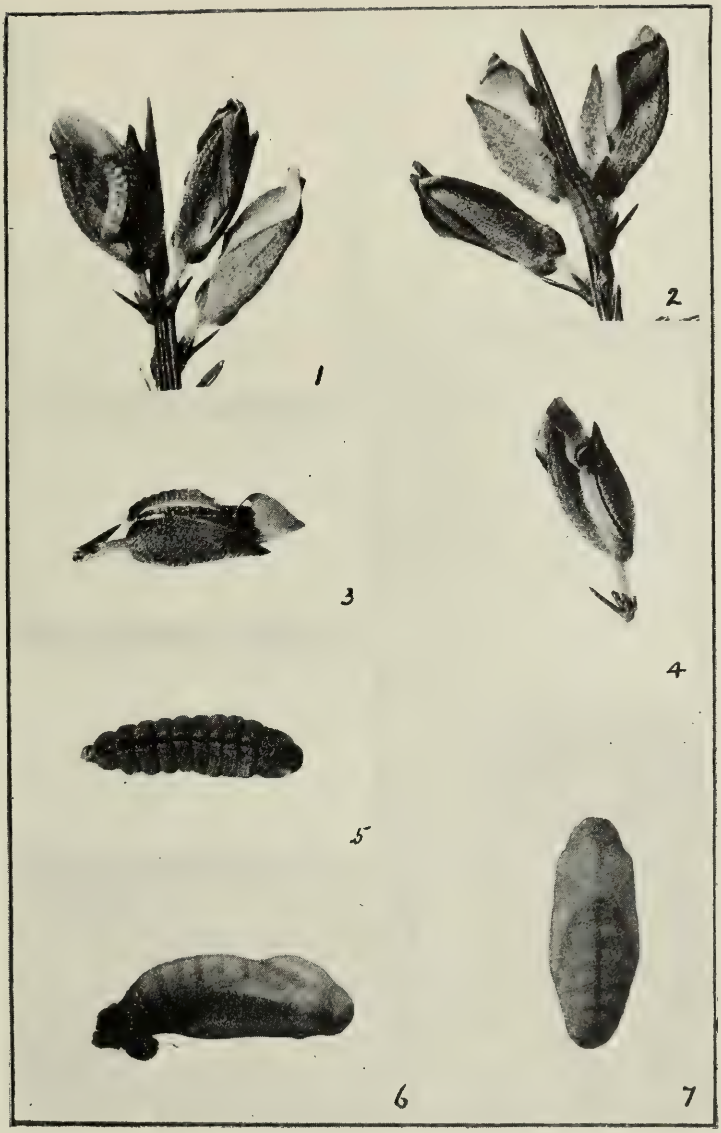

Photo. H. Main and A. E. Tonge.

PLEBEIUS ARGUS (ÆGON).

FIGS. 1-4.—LARVA (NAT. SIZE). FIG. 5.—LARVA × 2.
FIGS. 6-7.—PUPA (LATERAL AND DORSAL VIEWS) × 2.

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[*To face p. 210.*]

rate of feeding, for larvæ that hatched on April 1st, 1903, were, on June 1st, some in the second, others in the third, and yet others in the fourth, instar, varying in length from 2·5mm. to 6·25mm., yet closely resembling each other in general appearance. Chapman observes of some larvæ he had under observation, on April 2nd, 1908: "The larvæ, in glass tubes, on *Ornithopus*, are doing well, and take readily to flowers of *Ulex*, being already in the third instar; those on a growing plant of *Ornithopus* are doing badly, and have dwindled from more than forty to about half-a-dozen, and these have only just entered the second stadium; whilst those put on *Erica* seem to have disappeared altogether; of those larvæ put on growing *Ornithopus*, there is one on a small seedling-plant, growing up amongst the *Ornithopus*, as yet unrecognisable, but not only not *Ornithopus*, but not leguminous; this larva is to be seen eating this somewhat succulent seedling, and is in better condition than any on the *Ornithopus*; being left on the little plant, the larva continued to thrive thereon; the plant also did well, and finally proved to be *Plantago coronopus*. The other larvæ on the growing plant of *Ornithopus*, were, from this date (April 2nd) reared in a tube; by May 3rd, these larvæ were nearly all in the last instar, and doing well on *Ulex* blooms. Several of them have some material like white mould, on them, at or near the honey-gland, not quite perfectly washed off with a camel-hair brush and water, but nearly so; one or two died in penultimate skin, apparently as a result of this mould attacking the larva itself, but so far none have suffered seriously in the last skin. Several are thinking of pupating, as evidenced by a little shrinking, a blurring and fading of colours, so that the dorsal line is only faintly brown, and the black hair-bases on it are more conspicuous, elsewhere they are pale; the green has taken on a sickly whitish shade; the prothorax is nearly colourless, and very translucent, taking its colour more than before from the black head, when retracted. So far, no definite attempt at a cocoon or a girth is observed. On March 31st, a larva was observed moulting, the skin splitting nearly all the way down one side, and forming a sort of balloon over the other side of the larva. Usually, however, the skin opens more or less on both sides, and then, as the larva emerges, shrinks back to about half its length. A larva at its first moult, left its skin almost larger than before the larva left it, and like a blown skin. The larvæ do not eat their cast skins. One larva (in a test-tube) bored a hole into the cork, apparently with a desire to hide for pupation. The fullfed larvæ, especially when contracted and sulky, often show the 'fan' glands (of the 8th abdominal segment) whilst completely retracted, as small cones, or perhaps better volcanic cones, the top being truncated."

Symbiosis between larvæ of Plebeius argus and ants.—Plötz records (*Stett. Ent. Ztg.*, 1845, p. 115) finding larvæ of *P. argus* on *Calluna vulgaris*, and was much puzzled at seeing that every larva had an ant standing on its back; he also saw about 40 larvæ near ant-hills, the ants always on the larvæ, standing or walking, and apparently the larvæ in no way incommoded or molested by them; indeed, he thought the ants seemed to try to protect the larvæ from his interference; he adds that not one of these larvæ was affected by ichneumons, and all produced butterflies. Powell observes (*Ent. Rec.*, xviii., p. 214) that, in May, 1906, he found that larvæ of this species, green in colour, with a dull crimson dorsal line, possessed quite tall processes on the

8th abdominal segment, and that the larvæ were attended by ants, the larvæ keeping out the little tubes until an ant touched them with its antennæ, when they were drawn in, but thrown out again as soon as the ant passed on; the larvæ, however, progressed quite satisfactorily when deprived of the company of the ants, the latter, therefore, not appearing to be necessary to the former's welfare. It is remarkable that Powell observed the "caruncles," or "evaginable processes," or "fans," on the 8th abdominal segment, but missed the essential fact that these were merely attractive, or guide-post, arrangements, and that, whilst these were withdrawn, the ant was most probably busy at the honey-gland on the 7th abdominal. It would appear that the larvæ have to get rid of the "honey" or "fluid" when not attended by ants, for Chapman notes (*in litt.*) that, on April 15th, 1908, whilst he was looking at some larvæ in confinement, one exuded a clear drop of fluid from the honey-gland, and that, at the time, the bases of the "fans" on the 8th abdominal, appeared as quite large, pale circles, with darker margins (? of lenticles). Gillmer states (*in litt.*) that Viehmeyer reports finding larvæ of *P. argus* with *Lasius alienus*. It is also doubtfully recorded by Torka with *Formica cinerea*.

Ontogeny of larva.—*First instar* (April 1st, 1893): When newly-hatched, about 1mm. in length, rather stout in proportion; the colour pale ochreous-green, darkest on the dorsal surface, becoming paler laterally, and palest on the venter; the body sprinkled with dark brown warty spots, some extremely small; the largest, those on dorsal area, emit long greyish hairs curving backwards, excepting those on prothorax, which curve forwards; the other warts (? primary tubercles) principally run in longitudinal rows, forming supra- and subspiracular series, each emitting a fine greyish hair. Head black; the true legs brown; the prolegs of the same colour as the ventral surface. First moult end of April. *Second instar* (May 1st): About 2mm. in length; the back arched; the sides very sloping; the ventral surface much flattened. Head shining black, retractile within, overlapping prothorax; colour of body pale ochreous, with mediodorsal, subdorsal, and lateral, dark chocolate-brown, longitudinal lines, each bordered by a whitish-buff line; the whole surface sprinkled with dark brown, watery-looking discs, flattened and semitransparent on their summits; there are also longitudinal rows of greyish-green, short tubercles, each emitting a curved whitish hair. On the prothorax, a dark purplish-brown dorsal blotch. The true legs black; the prolegs ochreous. *Third instar:*[*] 6·25mm. in length; colour pale greyish-green, with a dark chocolate-brown mediodorsal stripe, bordered on either side by a white line, and a double grey-green (darker than ground colour) subdorsal stripe composed of two slightly oblique marks on each segment, each bordered above by whitish; a lateral dilated white stripe, bordered below by an olive band; the

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[*] Chapman has carefully proved that the larva of this species has only "four" stadia, and three moults. Frohawk calls this the "Fourth" instar, and notes the "Third" as exactly like the second, except in size, length = 4mm. Great care must always be exercised in accepting Frohawk's statements as to the stadia in which larvæ are, as he appears from his descriptions, not to follow up any particular larva, or to give data of invariable structural items, *e.g.*, size of head, etc., in a given instar, but guesses the stadium by the size of the larva, sometimes, as in this case, apparently, erroneously.

venter grey-green. Head small, intensely black, shining. The large compressed prothorax, with a conspicuous chocolate-brown patch in centre. The body clothed with exceedingly fine short hairs; those on the dorsal area the longest, and curve backwards. Third moult (most forward larvæ) during first week in June. *Fourth instar* (fullgrown June 20th): Length 12·5mm. at rest; 14mm. when extended; the prothorax protuberant, flattened and rounded in front, completely concealing the head; from mesothorax to 6th abdominal (both inclusive) the dorsum is considerably elevated, the segments of uniform size, their sides flat and sloping to the lateral dilated ridge, the mesothorax rising abruptly above the prothorax; the last three posterior segments are flattened, especially the anal segment, which terminates in a broad, rounded, much compressed flap, similar to prothorax; the 8th abdominal is furnished with two retractile tubercles, which are occasionally thrust out when the larva is alarmed, otherwise they remain withdrawn, forming short blunt processes; these structures are pale straw-yellow in colour, and, surrounding the apex of sheath, is a series of black warts, each terminating in a short spine resembling a thorn. The ventral surface of the larva is much flattened, and, while resting, it lies so flat that the true legs and prolegs are almost hidden. Head very black and shining. Ground colour of body very pale green; a dark purplish mediodorsal stripe runs down its entire length; broader on prothorax, bordered on either side by a white line, then a pinkish and green band blending into the pale green of the ground colour, followed by a conspicuous subdorsal dark green stripe, composed of a series of rather oblique marks, one on each segment, and a somewhat similar stripe, but narrower, running parallel to it immediately above spiracles; a subspiracular, dark green stripe, edged below by a white stripe, passes along lateral ridge which borders on the green of the ventral surface. Spiracles white. The entire surface thickly sprinkled with black and white granulations, the white ones predominating, each granule emitting a very minute, fine, ochreous hair; those along the dorsal surface longest and stoutest. The true legs greenish; the prolegs green and brown-pink. The segmental incisions well-marked, the segments strongly defined, and somewhat overlapping. [Another form of larva, of almost equally frequent occurrence, has the first subdorsal and subspiracular stripes lilac-red, with the ground-colour usually more tinged with olive, giving the whole a decided reddish hue (Frohawk).]

Larva.—*First instar* (newly-hatched, February 23rd, 1908): Grey-brown in colour, semitransparent, with very dark hair-bases, those of tubercle i so prominent, as to give the larva on side view a saw-edged margin on top, not unlike *Strymon pruni* in its last stage; the lateral flange is also somewhat sharp and prominent; the middle hair of the three in the subspiracular (flange) set, is very long, and is a feature of the larva on dorsal view. The head is black, and the dark prothoracic and anal plates are easily seen. *First instar* (fullgrown, March 14th, 1908): As the larva grows in this stage, it becomes darker, and gradually develops markings that are, at the end of the stadium, very pronounced and distinct. The head is 0·25mm. across, black, polished; the prothoracic plate black, diamond-shaped, the prothorax as wide as the 2nd abdominal, and the mesothorax nearly as wide again. The larva is about 2mm. long, a fat, cylindrical, little fellow; the pattern almost too elaborate for easy description. The dorsal plain or groove is dark rich brown, broadened a little on the thorax; the dorsal flanges are tipped with white, giving the effect of a pale line along i; there is again a pale line along the two little hairs, representing iii, and another along the lateral flange (iv and v); the area between i and iii is pale terra-cotta, with a few darker marblings, the area between iii and v is nearly as dark as the dorsal plain; there is less dark area below the pale lateral line, only interrupted by a short white streak through vi; this gives the effect of a white line, though, on each segment, it extends to hardly half the width of the segment; there is also a little pale vertical streak in front of, and above, this longitudinal one. There are also white patches in the areas between tubercles i to iii, and between tubercles iii to v, which look like representatives of oblique stripes; the hairs stand out colourless, or brilliant and silvery in a good light; their bases are the same colour as the skin; though I mention these white spots vaguely, they have their exact and definite position on each segment. The white streak through tubercle iii does not quite turn round the ends on prothorax and terminal segments, but so nearly does so that, on a dorsal view, it appears as a continuous line round the insect. On the abdominal segments, the seta of i has a large, black, thimble-shaped base, with a long, white, spiculated hair, curved so as to be directed first rather forward, then upward, then backward, in length about 0·3mm.; ii is much smaller, at an appreciable distance outside, and behind, i, with a short hair (less than 0·1mm.). There is a minute hair at anterior border of segment, just in line with ii, and usually hidden in incision; below ii are two large lenticles placed diagonally, the first one upper; below this are two very minute hairs at a level, then the spiracles on a flange, and below this another flange with three hairs on a level, the middle rather the longest, and below this several hairs above bases of prolegs; the two little hairs above the spiracle are extremely short, clubbed, and rather directed towards each other, and look very different from the other hairs. On the 2nd, 3rd, and 7th abdominal segments are lenticles, above the prolegs, amongst the lower hairs; on the 7th abdominal, the highest lenticle takes the place of ii, and on the 8th abdominal it has worked round to the front outer angle of tubercle i (if it is i). The thimble-shaped bases of the hairs are all black, and the three flange-hairs give a row of marginal dots when the larva is seen from above. There is a lenticle in front of, and below, the spiracle on the 1st abdominal segment, and one behind the spiracle on the prothorax; the hairs are all finely spiculated, those of i, 0·30mm.-0·35mm., and even 0·4mm. and 0·45mm., long, on front and back segments. The prothoracic plate has a lenticle on the middle of the front margin of each side, a hair within and behind this, and another rather behind centre of each side; three hairs, in front of plate (on each side), and three on flange below these, and in front of spiracle. The 7th, 8th, 9th, and 10th abdominals have no incisions through the flange; the anal plate is without hairs or lenticles; there are two hairs on the second flange (the flange proper is that carrying the three little hairs noted above). The prothoracic plate has, on each side, besides the lenticle and two long hairs, a minute stubby hair at front angle, and the curious filamentous hair at outer angle. In a specially preserved dry specimen, the special filamentous prothoracic plate hair stands up 0.05mm. high, stiff and straight, and with very fine, but rather long, spicules; the other hairs on this segment are three along the front margin of plate, one near its outer angle, two well in front of spiracle, and the two smaller marginal ones; a large lenticle in front of spiracle. On the mesothorax there are the usual hairs of tubercles i and ii in a posterior position, with another i and ii (?) with a large lenticle between them in front; there is a very short clubbed hair in position of iii, with four flange-hairs below, and two smaller marginal. The metathorax is just like the abdominal segments except in having only one lenticle, and, of course, no spiracle. The 1st abdominal segment differs from the others in having a large lenticle in front of spiracle. The 2nd abdominal segment has a lenticle in place of the posterior of the two marginal hairs. The 3rd to 6th abdominal segments have a lenticle between these two marginal hairs, and, in addition to them, the 7th and 8th abdominals want one of the hairs, that is, have a lenticle and one hair only. The 7th abdominal has no hairs on ii, and none on iii (but there are two hairs above spiracle). The 8th abdominal wants the small hair in front of i, present from the 3rd thoracic to the 7th abdominal segment, and has i and the two lenticles almost fused together. The flange-hairs of the 8th, 9th, and 10th abdominal segments cannot be definitely assigned to their several segments. The two supraspiracular hairs (iii ?) deserve fuller description, as being one of the items in which these species of "blues" differ most from each other in the first instar. They are small, about as long as the height of the base of i, much the same as those on the anterior margin of the segments, *viz.*, 0·03mm. as a maximum, some rather shorter; the front one is rather longer, a little directed downwards, and with sometimes a slight curve; both are club-shaped, *i.e.*, widening all the way to the rounded end, the posterior one a little more expanded in proportion to its smaller size and directed slightly forwards; both are armed with very minute spicules. These, as well as those on the other hairs, are very transparent and difficult to see; they are plainest on ii, which is slightly clubbed or thickened and curved, so as to have something of the scimitar-form, with spicules well-developed along the convex margin. The general surface is closely crowded with rather sharp skin-points. Each (front and back) pad of prolegs has a large and a small hook; on the anal claspers the back pad has only the large hook. The legs and anal plate black, as well as the bases of hairs, and abundant skin-points. *Second instar* (March 18th, 1908): When about halfgrown in this instar, 2·6mm. long, about 0·6mm. wide, of same width from end to end, except the actually rounded ends. The prothorax is low, and it slopes backwards from the 6th abdominal; otherwise, the height is pretty level, say from mesothorax to the 6th abdominal; each segment a little raised and rounded, but with no definite hump. There is a dorsal line or band (in the groove or plain) narrowed at the mid-segment, broadening a little on the mesothorax, and on the 8th and 9th abdominal segments, and represented on prothorax by the plate, of a rich, dark red-brown; there is a similar dark line just above the spiracles; this consists, however, of several separate round patches on each segment; above it is a pale narrow line, hardly expressed in some specimens, but there are three other distinct whitish tracts on each side; the first along the dorsal flanges (not the one already noticed), then a spiracular one, and most distinct of all, one along the lateral flange; between the spiracular white line and that of the lateral flange is a dark band, not quite so dark, however, as the other ; and between the two upper white lines is an area of terra-cotta tint, but often with an outlying patch of the lower dark line towards its anterior border. From the dorsum downwards, then we have, (1) very dark, (2) white (dorsal flange), (3) terra cotta, (4) white (narrow, often indistinct), (5) rather dark in patches, (6) white (spiracular), (7) somewhat dark, (8) white (flange line) ; below this is (9) a darkish band, and then (10) the terra-cotta or almost flesh-coloured under-surface. There is a white patch or two on the subspiracular dark surface ; indeed, with a strong lens it is seen that the lines or bands are not definite and outlined, but are more properly aggregations of patches. The whole surface has much the appearance of an old strong door, the very large, shining, nearly black, hair-bases and lenticles, looking like the very large nail-heads, seen on such doors ; the general surface also is finely shagreened with minute black skin-points. The head is shining black. It is almost impossible to tell the spiracles amongst the lenticles, and details of these and hairs will have to be taken from a prepared skin. The longer dorsal hairs are dark, the others, especially the lateral ones, nearly white (or colourless), the longest about 0·1mm. long. In this (second) instar, the hairs are not so much multiplied as to prevent those of the first instar being for the most part recognisable amongst them. The head is 0·4mm. across. The prothoracic plate 0·33mm. across. In one of my mounted specimens, there happens to be presented what I have not attempted to show, but which might easily be done properly, *viz.*, a front view of the prothorax with the head removed, exhibiting an oval opening, 0·3mm. across, and 0·2mm. longitudinally ; it shows the very sharp skin-points ending at a definite line, the margins and incurved membrane being smooth ; the incurving of the margin also demonstrates that, when the head is retracted, it is in a bag of which the mouth is contracted by the elasticity of its margin, apart from any further closure that may be produced by muscular action. One feature of the increased number of hairs, is the evident want of symmetry that results, *i.e.*, the increase does not take precisely the same character and amount in one specimen as in another, or even on the two sides of the same specimen, *e.g.*, amongst the various specimens I have mounted, the prothoracic plate has not precisely the same hairs and lenticles in any two specimens. In the one photographed (pl.) each side has one of the two long central hairs about 0·14mm. or 0·15mm. long ; it has also, of course, the special filamentous hairs, 0·1mm. visible, possibly longer. There is also the hair that was on the hind-margin in stage i, but is now free from the plate just behind it ; it is short, thick, slightly clubbed, beautifully and densely spiculated, and about 0·05mm. long. Near the middle on one side, is a large lenticle, on the other side, in correspondence with the lenticle, is a short (0·04mm.), spiculated, clubbed hair. In front of this hair, close to the margin, is a similar, but rather smaller hair ; corresponding with it on the other side, and in front of the lenticles, is a small circle, too small to be called a lenticle, but may be called an obsolete hair-base. In front of the special filamentous hair, is an area clouded with fine dots (same on both sides) much smaller than the skin-points which more or less cover the surface of the plate, and, amongst these, one or two minute circles that suggest not so much

PLATE
XXV.

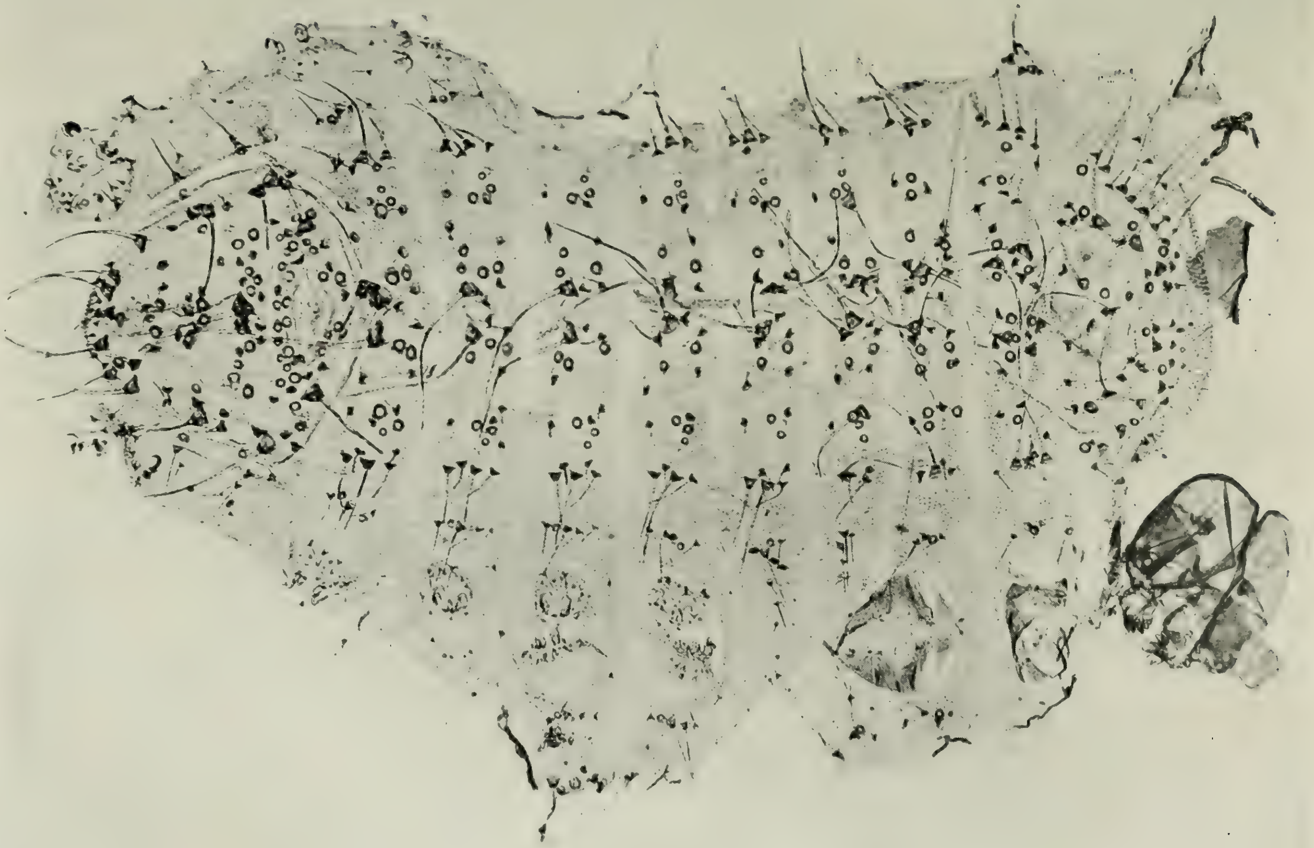


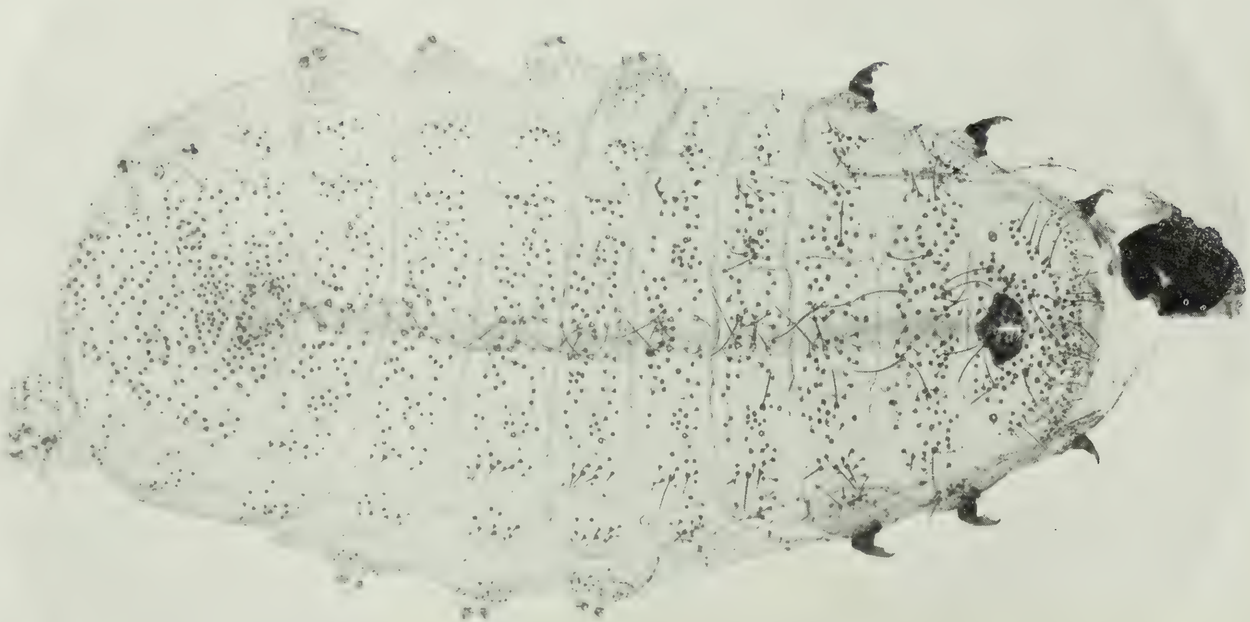
Photo. F. N. Clark.

LARVAL SKIN OF PLEBEIUS ARGUS, SECOND INSTAR × 48.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* **216.**]

obsolete ordinary hairs, as such hairs as the special filamentous one. One point that comes out is that the hairs, etc., have moved backwards, or, otherwise expressed, the chitinisation forming the plate has moved forward. The posterior hairs have moved backwards off the plate, the lenticle has moved from the front margin to the middle. In another specimen, one side has a lenticle close to the special hair, and another just in front of the middle, the other side has none; each side has three symmetrical hairs, and one or two not represented on the other side; this plate is more fully armed than the one noted above. Another specimen has a large lenticle and two long hairs (longest, however, about 0·05mm. only) symmetrically placed on each side, and several obsolete hair-bases irregularly placed; the hair displaced backwards is duplicated on one side. It would be tedious to describe several other specimens, but no two are alike. It is obvious, however, that no detailed description of the disposition of the hairs at this or later stages can have much, if any, value for defining specific characters. On the remainder of the prothorax are, on each side, some 35 hairs, and one or two lenticles. On the mesothorax, in the specimen selected for description, there is a dorsal azygos lenticle, the dorsal hairs on i and ii doubled as in the first instar (*anteà*, p. 215) with lenticles, and, in addition, eight or nine hairs down to the region of iii; the flange hairs are six, the marginal five and a lenticle. The mesothorax has the setæ of i and ii both large, with two or three smaller hairs, and two large lenticles; the spiracle has, immediately above it, two large lenticles and a long hair (0·2mm.), and a small club-shaped one; the flange-hairs four in number, the marginal three and a lenticle. The 2nd abdominal has precisely, as in the first instar, three dorsal hairs and two lenticles, but, instead of the two minute hairs on iii, it has, like the 1st abdominal segment, a long hair (iii) above the spiracle and a short one and two lenticles; on the flange four hairs, and three marginal hairs and a lenticle. On the 3rd, 4th, 5th, and 6th abdominal segments, tubercle iii no longer has a long hair, but, as in the first stage, carries two clubbed hairs, proportionately larger, together with two lenticles. On the 7th abdominal segment, that on iii is much the longest hair on the segment, and immediately above the spiracle; it is about 0·2mm. long, its base and basal half are like an ordinary hair; its terminal half is, however, swollen, so as to make it a very large specimen of a clubbed hair; the other hairs on this segment are small; the dorsum has the slit of the honey-gland 0·2mm. long, with some 23 large lenticles (from spiracle to spiracle), and several grand, clubbed, or rather balloon, hairs, almost spherical, and beautifully spiculated; the flange-hairs possess one very large one, as no segment in front does. The 8th abdominal segment has two very long dorsal hairs (i ?), one 0·25mm., its fellow 0·18mm., abbreviated, but specially swollen apically in compensation; there are also, above the spiracles, two lenticles, and five or six balloon hairs; the presence of the fan-organ is distinct, but its structure is not determined. The 9th and 10th abdominal segments have many hairs; these have, amongst them, a considerable number, of shorter, sharp, apparently hardly-spiculated, hairs; the hair-bases have striations on their lower halves, but these hardly rise above the surface, and are mere indications of stellate structure. There is no anal plate. The prolegs have one long, and two (or sometimes three) short hooks to each pad; sometimes two are long; the anal claspers have two long and one short, but, in one case, one side is so the other has four medium and two long. The skin-points are very numerous; in profile they are sharp and pointed, in vertical view they have several radiating or zigzag lines. *Third instar* (newly-moulted March 31st, 1908): Two specimens in this instar (one a little grown) 4·0mm. and 4·5mm. long. [Much the same in general markings as in previous instar, rather darker, perhaps, but, in previous instar, the larva assumes a brighter colour as it grows, and this will doubtless do the same.] The broad dark dorsal band is distinct, the rest of the larva not so dark, and, though the markings seem the same as in last instar, are much less distinct, and the brown slopes have a distinctly olive tone, suggesting, of course, a greenish deeper layer. The form is also the same—broad, flat, with sides parallel from nearly end to end. The "fans" on the 8th abdominal segment were displayed by one specimen several times in walking about, and are very large, and, being pale, very conspicuous; when retracted and quiescent, their position is still very obvious as a rather pale circular spot; in this instar the hair-bases are conspicuous as (?) white dots. *Third instar* (nearly full-fed, April 5th, 1908): 6·0mm. long; nearly same width from end to end, and same height from mesothorax to 6th abdominal segment. The prothorax distinctly at a lower level than the mesothorax, which overhangs it a little, and looking, on side view, very like the 7th-10th abdominal segments at other end, so that the two ends are very similar; the central segments have a distinct serrated arrangement seen laterally, the highest point of each segment being at about the junction of the middle and posterior third; the front portion has, therefore, a less slope; the slopes are at about 90° or 100° to each other. To the naked eye, the larva is of an inconspicuous dirty-grey colour, but, under a lens, this effect is seen to be produced by elaborate markings of pleasing and contrasted colours. The broad dorsal band (flat, hardly furrow) is of a rich red-brown, a little widened on the meso- and metathorax, and narrowing a little backwards to 6th abdominal segment; it has a fine creamy-white line on each side, in which are black dots of hair-bases (white just after moult). The lateral line is white, but does not show on a dorsal view; it is conspicuously dotted with dark hair-bases. The slope between these two white lines has six longitudinal lines or bands; the upper, nearly, but not quite, as wide as the other five together, is a pale olive-green, then a pale brown, an olive-green, a very pale brown, these two very narrow, then an olive-green, then a pale brown; the latter encroaches on the olive above it, so as nearly to divide it into a series of spots. The prothorax hardly carries these same lines, but is rather dark, with a still darker plate; similarly, the 7th, 8th, 9th and 10th abdominal segments have the lines obscurely continued, chiefly as a dark central band, broadest behind, with white border. One specimen protrudes the fans now and then. On April 8th, the largest of these larvæ in the third instar, have now changed the olive-green to a definite apple-green. There is still the dorsal brown band, with its white border and the nearly white lateral line, the space between is green, though the lines between can be made out, especially the brown line, which, as a brownish line, is still plain; its portions on each segment being *en echelon*, *i.e.*, it is higher at the front than at the back of the segment, as are also the paler and darker



LARVAL SKIN OF PLEBEIUS ARGUS, THIRD INSTAR × 15.

Photo. F. N. Clark.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 219.

lines just below it. The change from a russet (olive and brown) to a green coloration is rather striking, occurring just as the larva becomes full-fed in this instar (not preparing to moult). In the third instar there are still, especially on the abdominal segments, longer hairs, that may be regarded as i and ii; for instance, on the 3rd abdominal there are, on each side, two long dorsal hairs, that are probably i and ii, the posterior, however, rather the longer (0·4mm.). From the dorsum down to the spiracle, each side has about 30 hairs, only one or two as long as 0·05mm., with one dorsal, and three or four spiracular lenticles; these short hairs are mostly somewhat scimitar-shaped. The head is about 0·7mm. across, the prothoracic plate about 0·5mm.; the latter carries eleven or twelve hairs on each side; the flange and marginal groups each have about ten hairs, with a lenticle or two; one of the hairs rather larger than the other (0·2mm.). The hair-bases all have stellate processes; these are generally somewhat sharply-pointed, rather below the middle of the conical base, point upwards, and have ridges running down from them to the skin-margin of the cone. Lenticles have similar processes, but they are smaller, more rounded, and close to their upper margins. There are comparatively few lenticles; there is a large flight round the honey-gland, especially along its posterior border, and at each end there are two or three special hairs about 0·05mm. long, gradually expanding, and more suddenly at the tip (like a flower of *Datura* or tobacco), where the spicules form a margin, but these hairs vary a good deal from specimen to specimen. The gland is a slit 0·4mm. across. The eversible fans are well-developed, and each has some 24 or so rays or hairs. The pads of the prolegs have each four to five, or even three to six, hooks of varying sizes, so that only one might be called long, or only one short. The anal claspers have five or six hooks on each pad, three long and three short, or often on posterior pad one very long one. In this skin the variation from specimen to specimen, in the size, form, and distribution of the hairs, is greater than in the second instar. The skin-points are closely set everywhere, their chitinous tops show four or five lines radiating down from the apex. *Fourth* (final) *instar* (newly-moulted, April 15th, 1908): The head about 0·9mm. across, the prothoracic plate about 0·8mm. The larva, 8·5mm. long, much resembles Buckler's figure. The green slopes (with pale lateral line) are modified in tone by the abundant, almost yellow, hair-bases, at present (the larvæ not having yet grown) very crowded together. The broad, deep red-brown (almost black) dorsal band, is bordered on each side by yellow; it narrows backwards, but, on the 7th and 8th abdominal segments, has a wide extension into, or, one might say, is interrupted by, a paler shield-shaped mark, reaching out to the lateral dark oblique line on the 7th abdominal, and narrowing again to a point on the 8th abdominal. Broader on the mesothorax, it similarly broadens out into a scutcheon on prothorax, which appears to be the prothoracic plate. The slope (above the pale lateral flange-line) has six lines, the first above the flange-line, a narrow darker green, then a rather yellower one, then two oblique darker lines, separated by a paler (yellowish) one, then an upper area, only a little less than the whole breadth below it. The oblique lines (downwards and backwards) do not slope much, but are by no means evenly longitudinal. There are longer, brownish, dorsal and lateral flange-hairs, and some between, but the abundant hairs that give a yellowish tone to the larva, are marvellous when somewhat magnified; their bases are like a cog-wheel, laid flat on the skin, with a very short clubbed hair rising from the middle, and both, sparkling like crystals, seeming to be of quite transparent glassy texture. The flight of lenticles accompanying the spiracles is black. The hairs vary in different regions, and will no doubt be very interesting when seen in a mounted skin. *Fourth instar* (nearly full-grown, April 27th, 1908): When stretched, about 12mm. long, 2·8mm. wide, and nearly 3mm. high, rather less when stretched and active; when walking, the larva narrows from the 6th abdominal segment (3mm.) the broadest (segment), to the mesothorax, where it is 2·2mm. or 2·3mm. wide. Seen on end, the lateral flange is well above the surface of rest; the slopes are faintly rounded, or say flat, but slightly full, the deep brown dorsal plain, about 0·3mm. wide at mid-dorsum, is flat, and separated by a ridge (flange) from the slopes on either side; this ridge is, however, slight, but made very pronounced (on end view) by the crest of rufous hairs. From the mesothorax to the 6th abdominal segment, the back (seen laterally) is about level, each segment rising for four-fifths of its length, and then falling rather suddenly in the posterior fifth to the incision. The colour is a deep apple-green, in only one or two specimens having enough brown to be called somewhat olive, but enough to suggest that variation might extend to a larva being as brown as in previous instar. The "slopes" are closely studded with the light points of the hair-bases, giving the green a darker tint when magnification enough is used to separate the light points, which affect the general effect when not individualised. They are a little irregular in disposition, but obviously tend to be in about ten vertical rows on each segment. Each segment has three paler stripes on its slope, obliquely downwards and backwards; the lowest contains the spiracle, the upper is further from the dorsal flange than the stripes are from each other. The brown (rich and velvety) is very narrow behind, except where it expands in a large paler escutcheon on the 7th and 8th abdominal segments, and gets broader forward—0·2mm. on the 6th abdominal, 0·5mm. on the mesothorax; it is bordered by a fine line, white, or yellowish-white. The prothoracic plate, about 0·7mm. from outer to outer angles, is wholly brown like the dorsal plain. The lateral flange-line is very distinct and obvious, of a yellow that is almost white. The head is small, black, shining. The underside is pale green, of a rather sickly, slightly olive, tone; the legs have their chitinous portions shining black. The hairs are now very numerous, and it would not be hopeful to decide which of five or six hairs might be taken to represent the seta of tubercle i. The hairs all appear to be of light tint, or colourless, but a very decided colour effect, of which practically no trace exists in the previous instar, is produced by the hair-bases and skin-points being nearly black in some places, nearly colourless in others; the lenticles are nearly always dark. The complication of colour and form of hairs and hair-bases with different areas is so great, that no description of moderate length would meet it. Some faint approximation, therefore, must be attempted. First the dark dorsal band of the larva is not probably caused but reinforced by the skin-points along it being black, and the hair-bases also. The hairs here are two to four in the width of the band, more when the band is wider. The hairs are very short,

PLATE XXVII.

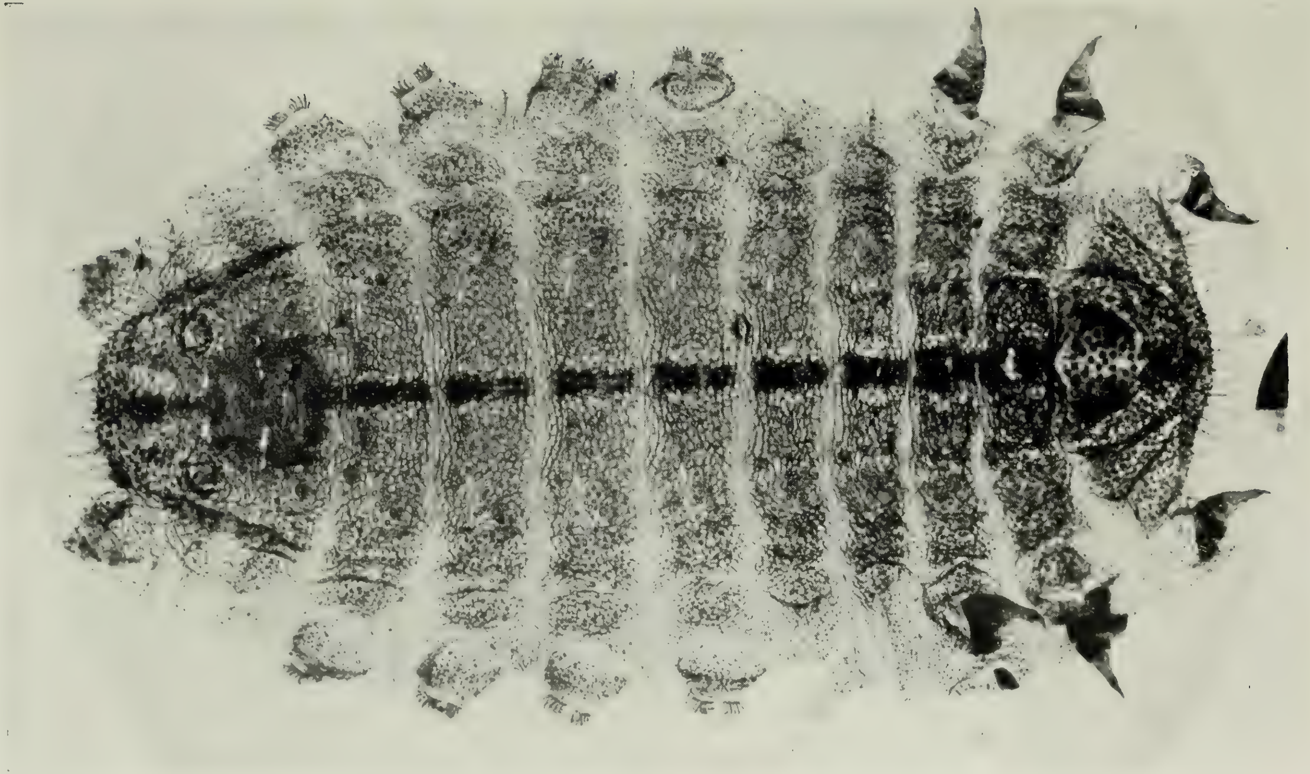
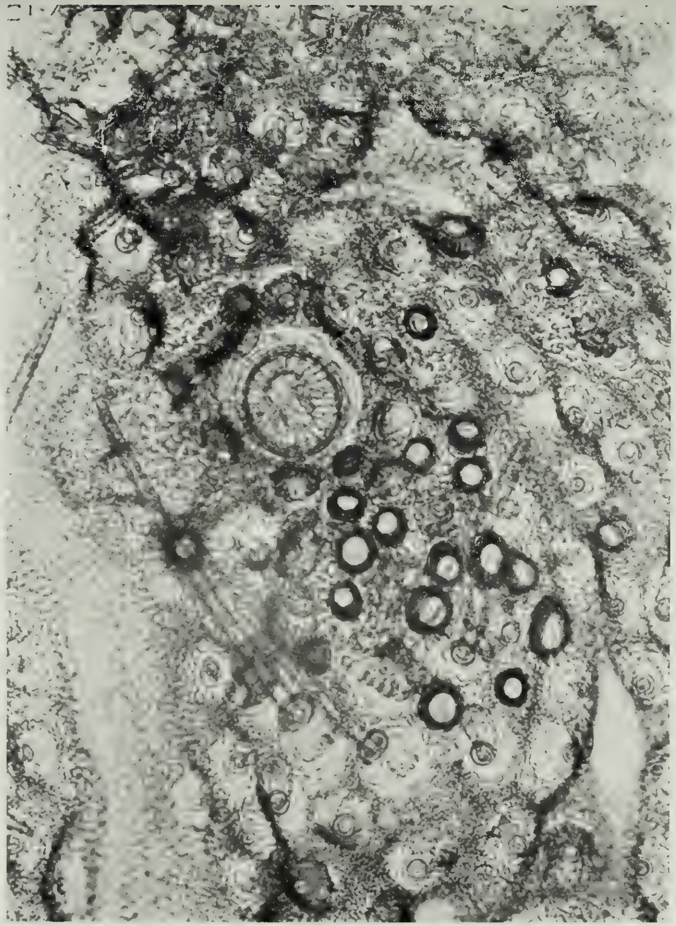


Photo. F. N. Clark.

LARVAL SKIN OF PLEBEIUS ARGUS, LAST INSTAR × 14.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 220.]



1. Spiracle of 1st abdominal segment of larva of Plebeius argus, last instar × 150.

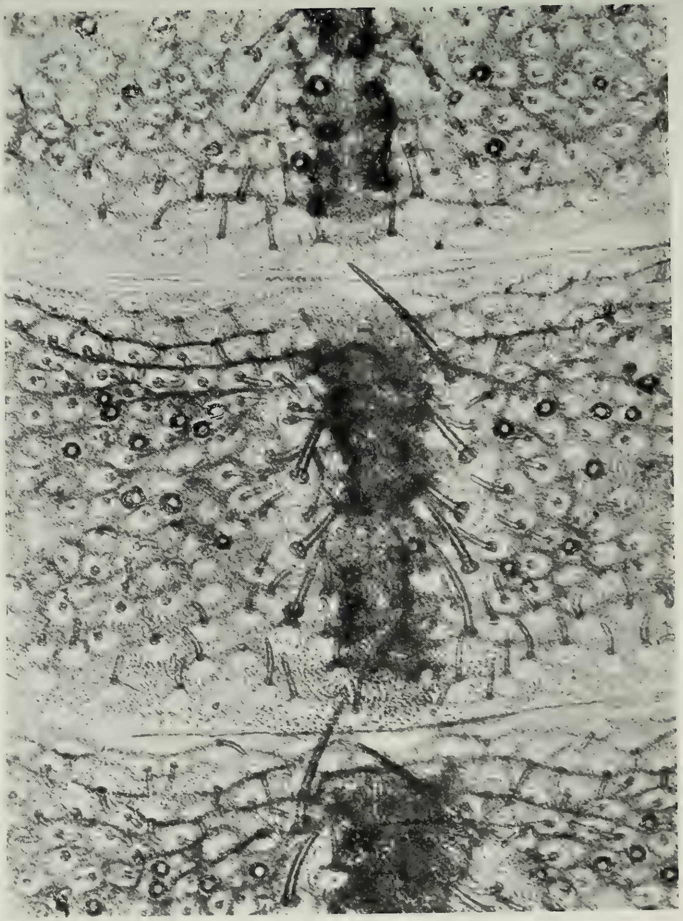


Photo. F. N. Clark.

2. Dorsal area of 4th abdominal segment of larva of Plebeius argus, last instar × 60.

Larval structure of Plebeius argus.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 220.]

Plate XXIX.

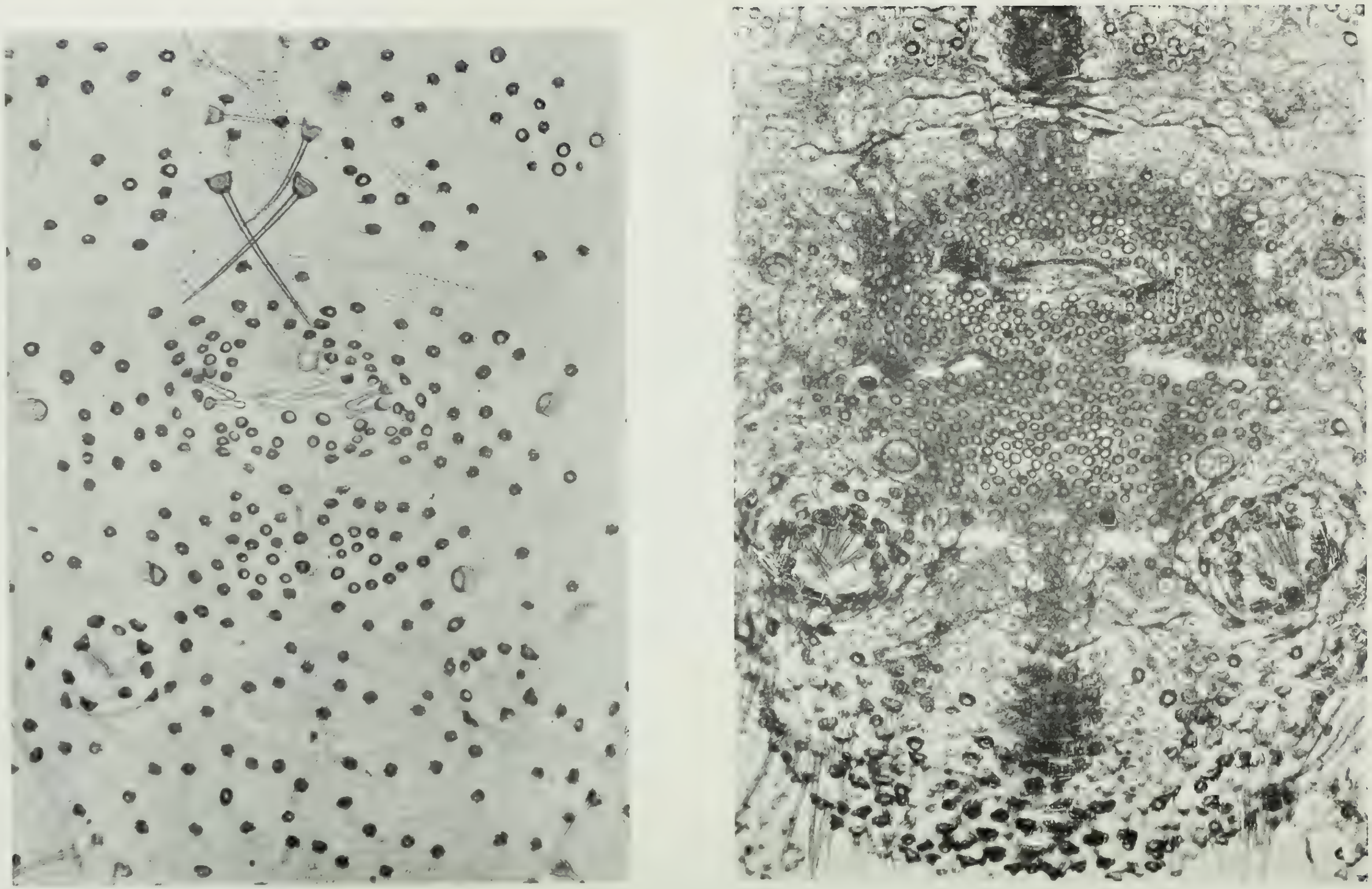


Photo. F. N. Clark.

1. Dorsum of 7th and 8th abdominal segments of larva of Plebeius argus, 3rd instar × 50.

2. Dorsum of 7th and 8th abdominal segments of Plebeius argus, final instar × 45.

The Seventh and Eighth abdominal segments of larva of Plebeius argus, showing honey-gland and eversible caruncles (fan-organs).

A Natural History of the British Butterflies, etc., 1909.

[*To face* p. 221.]

PLATE XXX.

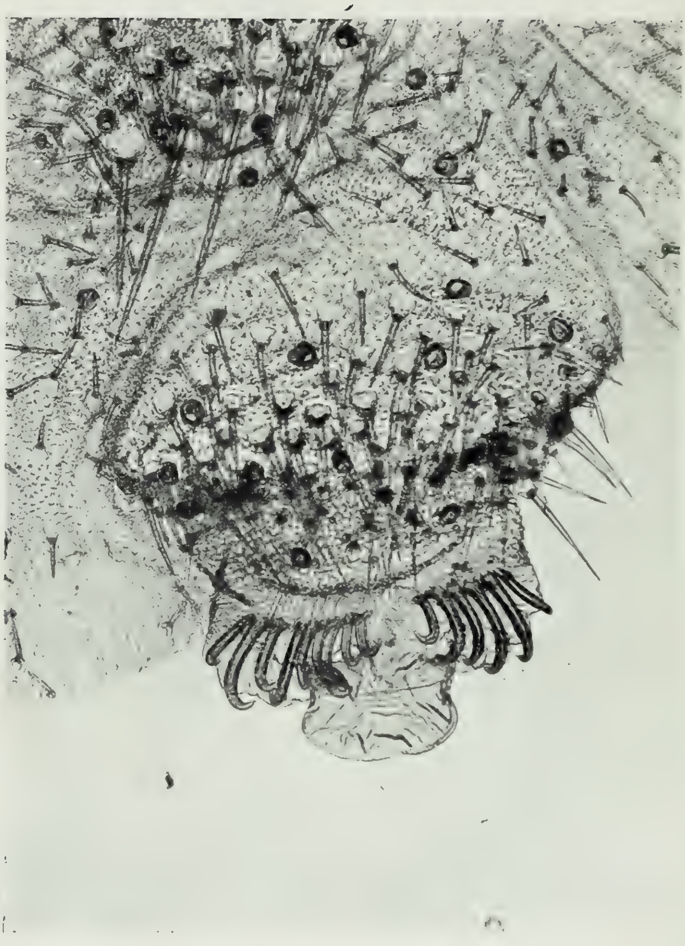


Photo. F. N. Clark.

PROLEG OF THE LARVA OF PLEBEIUS ARGUS, LAST INSTAR × 80.

A Natural History of the British Butterflies, etc., 1909.

[*To face* p. 221.]

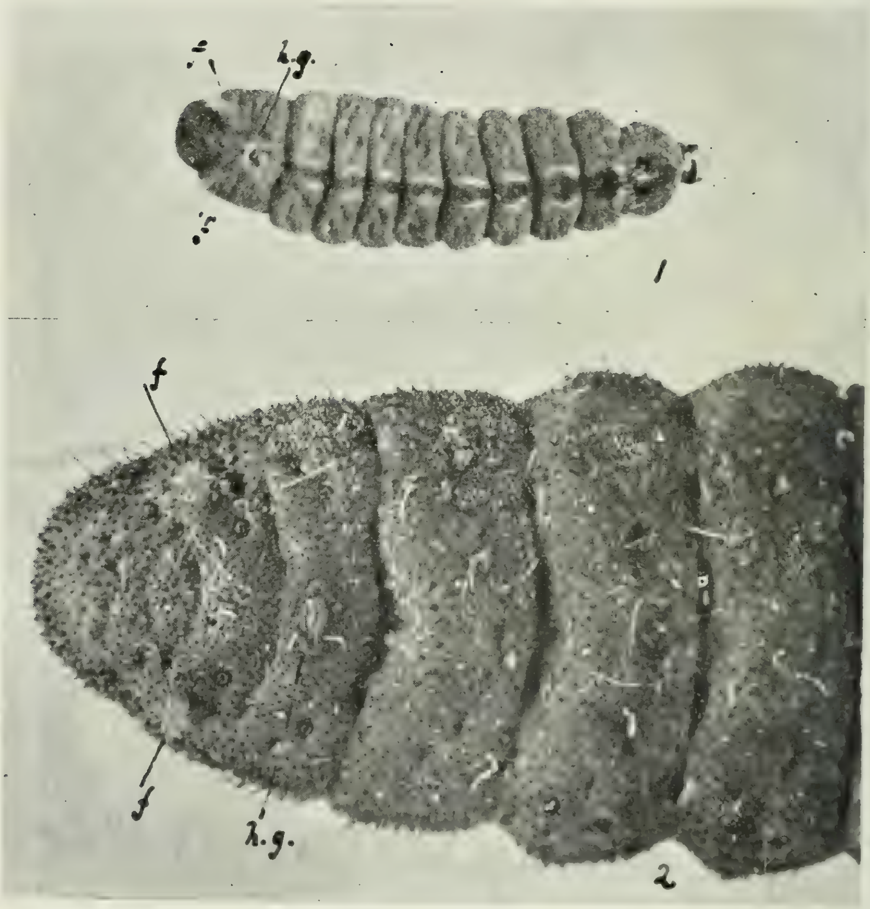


Photo. H. Main.

The Honey-gland and Eversible caruncles (fans) of Lycænid larvæ.

1. Larva of Plebeius argus (ægon). *h.g.* = honey-gland, *f.* = fans × 5.

2.—Posterior segments of larva of Agriades thetis (bellargus). *h.g.* = honey-gland, *f.* = fans × 10.

0·03mm. to 0·05mm., rarely more, curved, and well-spiculated. The bases are rather flat; a central dome, from the top of which the hair rises, has round its margin twelve to fifteen or more, short, upstanding spikes, forming a very beautiful object. Along the side of this band is a pale area in which one hardly sees the skin-points and the hair-bases, which are colourless, though of much the same structure, but apparently softer texture and more easily deformed in mounted specimens; this band is little more than one hair wide, but these hairs are large (to 0.3mm. long), and the setæ of i and ii are to be found amongst them if at all. Then comes a wide area, practically, one may say, the rest of the larva, in which, but with local variations, the skin-points are not black, but very visible, the hairs curved, thick, about 0·05mm. long, with colourless bases, but the lenticles very conspicuous by being nearly black. In the spiracular region are patches with black hair-bases, and, again lower, places with nearly invisible hair-points. In the marginal region are again some long hairs (0·3mm.); these, and those lower, have much longer, slender bases, with little trace of the stellate structure so conspicuous above. The honey-gland (0·45mm. long) is surrounded by a cloud of lenticles, and has, at each end, five or six special hairs clubbed or ballooned. The lenticles in front of the gland are largely displaced by hair-bases, with hardly a trace of hairs; they are, however, rather obsolete hairs than modified lenticles. When the honey-gland is expanded, it shows a colourless membrane, in the middle of which are four circles, like large, pale, narrow-bordered lenticles, with some intermediate structures. The fans on the 8th abdominal segment each show the bases of twenty to thirty hairs, but I have not succeeded in mounting a specimen to show its details. In a mounted skin it generally shows a circle, about 0·25mm. across, with a ring of hairs round it. In one specimen these are very ordinary straight hairs, thick, about 0·14mm. long, and about twelve in number, forming a striking object when all fall together at the centre. In most specimens, however, the hairs are shorter, 0·03mm. to 0·05mm., thick and curved; they are in a region with well-coloured bases. This illustrates the great variability in detail, noted in previous skins (after the first); one may further, in this connection, note a specimen in which the obsolete hair-bases are very numerous behind the honey-gland as well as in front. The pads of prolegs have nine hooks, alternately large and small (the longest about 0·08mm. long). The anal claspers have twelve or fourteen on the forward pad, one or two less on the posterior; in other specimens seven and eight hooks are found on a pad of the claspers, so here again is variability, and, in another, fifteen and nine on the front and back pads of the claspers (Chapman).

Variation of larva.—When hatched, the young larvæ are colourless, or of the faintest ochreous tint; as they grow in the first stadium, they become rather darker, and gradually develop markings which are, at the end of the stage, very pronounced and distinct. In the second instar they are very dark brown, with a good deal of paler marbling, and look rough from the prominence of the hair-bases, but, as they grow, they show much more distinctly the colour and markings. Amongst the larger larvæ there is a considerable amount of colour-variation, and, when about half-fed, the sparkling of the hair-bases, especially along the white dorsal flanges, is more marked than when they are nearly full-grown. One dark larva has the brown dorsal band with white margins, and a white lateral line ; the intermediate area (slope) is brownish-olive, deepening to a warmer flesh-colour along its margins, *i.e.*, against the white lines, and divided in the middle by a broad oblique band on each segment, sloping downwards and backwards, and consisting of four separate lines, an upper whitish, a second deep olive-green, then another whitish, and the fourth, lowest, a reddish-brown. In some larvæ the green is clear, in others, it has an olive tendency. The oblique lines exist in all, but in the palest larvæ they are represented only by lighter and darker greens (Chapman).

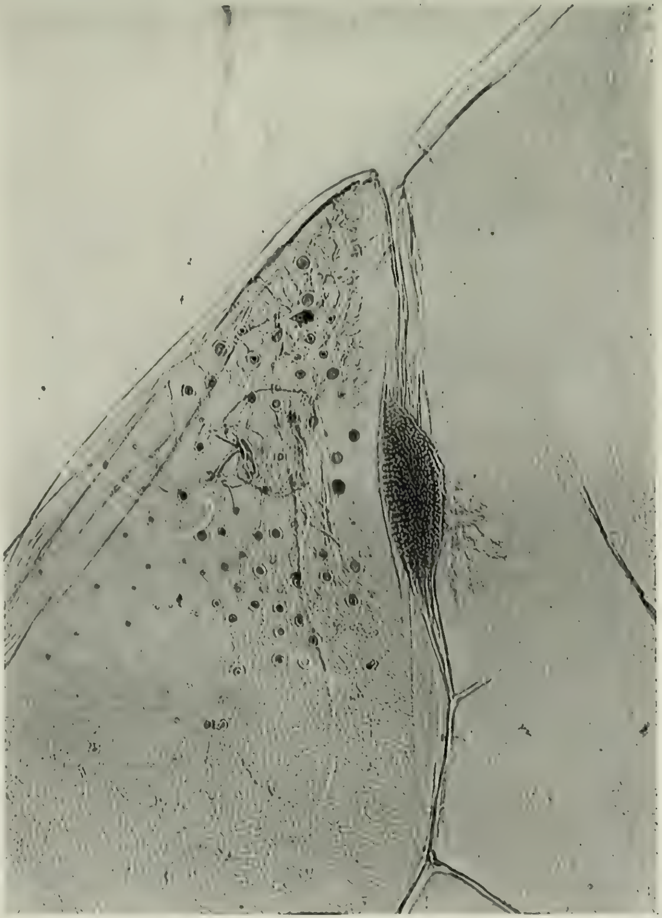
Foodplants.—*Genista vulgaris* (Borkhausen), *Colutea* (Hübner), *Lotus corniculatus*, *Ononis spinosa*, *Colutea arborescens*, *Erica* (Zeller), *Trifolium montanum* (Assmuss, Rühl), *Ornithopus perpusillus* (Buckler), *Ulex europaeus*, blossoms and young shoots (Hawes), *Erica cinerea* (Prideaux), *Calluna vulgaris* (Plötz, Rothke), *Dorycnium suffruticosum* (Powell), *Melilotus officinalis*, *Hedysarum* (Duponchel), *Onobrychis sativa* (Kranz, Dutreux), *Genista anglica* (Rühl), *Melilotus alba*, *Astragalus* (Curò), *Plantago coronopus* (Chapman), *Sarothamnus vulgaris*, *Genista germanica* (Schneider, Duponchel), *Cytisus laburnum*, *C. austriacus* (Hüttner, Kranz), *Genista tinctoria* (Brittinger, Richter), *Vicia* (Höfner, Rühl).

Puparium.—The larva, when preparing for pupation, seems to seek a smooth surface above the level of the ground, and away from its food. Here it becomes stationary, often with the head downwards, if on a vertical surface ; sometimes it gets underneath a flat surface, so as to be back downwards. Little silk is visible, and only a stray thread or two are sometimes seen that may represent, but are very far from resembling, either a cocoon or a girth. When it changes, the larva skin is quite loose and falls away, and the pupa is attached by its cremaster, but so slightly, that the slightest disturbance loosens it (Chapman, May, 1908). The full-fed larvæ spin a few strands of silk, pulling a few slender stems together round them, close to the ground ; in this they change to pupæ, apparently not attached by the anal hooks, but suspended in the silken web (Frohawk). Buckler notes that the larvæ he reared in 1868, had turned to pupæ by June 24th, one of them being slightly attached to a stem of *Ornithopus* by the anal extremity, and lying, like the others, amongst a few loose threads at the very bottom of the stems, and partly in the earth. Aurivillius announces (*Ent. Tids.*, v., p. 227) that, in northern Småland, he found six pupæ of *P. argus* (*aegon*) under the bark of a pine-trunk inhabited by *Lasius niger*. The chrysalides were found in the cavities made and frequented by the ants and were enveloped in coverings of exceeding thinness and transparency. It is difficult, he says, to attribute the presence of the pupæ in the ant-colony to chance, and thinks that possibly their presence had some connection with the sweet fluid which has already been observed as being secreted by some larvæ of the Lycænids. Buckler notes that, of the larvæ he reared in 1868, the last had changed to pupa by June 24th, and the last butterfly emerged July 17th, giving a pupal period of about 23 days. Frohawk notes of those he reared in 1893, that the first larva pupated on June 22nd, and the first imago emerged on July 10th, a period of 18 days. Paul and Plötz give the pupal period, in Pomerania, as 14 days.

Pupa.—*Living pupa:* Larger and narrower than usual in Lycænids.

A specimen 9mm. long, is 3·3mm. across the 3rd abdominal segment, and one 10mm. long, is 3·5mm., so that they are nearly three times as long as broad. The 10mm. specimen, 2mm. from the front, is 2·9mm. across the mesothorax, thence it increases to 3·5mm. at 6mm. from the front, the margins between, as seen from dorsum, being quite straight (the wings); thence it tapers without much curvature to 1mm. quite close to the rounded anal end. Seen laterally, the undersurface is very straight, a slight rounding upwards in the front 1mm. (head), and a slight downward projection of the anal extremity. The dorsal line rises to 3mm., at 2·5mm. from the front, hardly sinks to a waist at 4mm., and then rises to 3·3mm. at 6mm. (highest and broadest part of pupa, 3rd and 4th abdominal segments); thence the line curves regularly down to the posterior end, the curve being the longer by the last segment being, as already noticed, slightly bent ventrad. The furthest back part of the pupa is the dorsal margin of the 9th abdominal segment, the 10th abdominal being quite ventral. Though there are hairs, the pupa looks quite smooth and hairless, even under a hand lens. The colour is green, inclined to yellowish or olive on the abdomen, where the deeper tissues, shining through, are apparently yellowish, and the pupal skin itself has, in some specimens, a faint brownish mottling; there is a darker dorsal line, apparently coloration, not dorsal vessel. The wings paler, and very transparent, with tracheæ very visible. The appearance of the posterior end suggests more investigation as to its real structure, these parts, in Lycænid pupæ, having so far puzzled me. The appearance here is distinctly as if the 10th abdominal segment were folded underneath, its end reaching into the ventral aspect of the 8th abdominal. Such cremaster as there is, is quite ventral, and on what seems to be the posterior border of the dorsum of the 9th abdominal segment. There is a very broad margin beyond "Poulton's line," and the wings encroach somewhat on the 5th abdominal segment (Chapman). The pupa measures 10mm. in length; smooth, without polish, the top of the head slightly projecting, the thorax rounded, the abdomen plump, curving on the back outwards and backwards towards the tip, which is hidden in the larval skin; the wing-cases prominent and long in proportion. It is of a dull green tint, with a dark brown dorsal line of arrow-head marks (Buckler). Another pupa is 8mm. in length. *Dorsal view:* Widest across the middle of the abdomen; the head is rounded; base of the wing is slightly angular and prominent, the wing curving gently over the side of the abdomen, and is rather swollen; the abdomen is attenuated to the anal extremity. *Lateral view:* Head rounded; thorax rounded and swollen, and nipped in behind; the abdomen is swollen about the middle, and curves to the anal segment, which is blunt, rounded, and furnished with hooks; the wing is a little swollen near the apex. The whole surface is smooth, but not very shining. The colour is pale ochreous-green; the abdomen is darker olive-green; head and anal segment only very slightly tinged with green; the wing shades into whitish at the apex, and is semitransparent; spiracles brown; a dull brown mediodorsal streak traverses the abdomen, and terminates in a dark spot on the 7th abdominal segment. (Description made when twelve days old.) About three days before the emergence of the imago, the pupa begins to deepen in colour, gradually changing to a dark leaden-grey, and finally the wings assume the colouring of the imago, but, of course, of a paler hue; the neuration and dark marginal band of the wing in the ♂ specimens, show very clearly (Frohawk). *Pupa skin* (mounted): The empty pupal-shell is an extremely delicate, flimsy, semi-transparent structure, more so than any other Lycænid pupa so far examined, and contrasting very much with that of *Callophrys rubi* and other Ruralids (Theclids). One would say at once that it was perfectly smooth and hairless; this is not, however, quite the case, as it has some very minute hairs, and one or two even so long as 0·075mm. The colour is brown, but so pale that it might be called colourless, a little less so towards the cremastral region. The cover of the prothoracic spiracle is darker, and forms a distinct dark spot on the pupa, and the skin-points and obsolete hair-bases in the spiracular region are darker, and give a faintly darker aspect to this portion of the pupa. The dorsal head-piece remains attached to the prothoracic margin; it is about 0·8mm. wide to either side of the middle line (both pieces together 1·6mm.); each lateral portion is triangular, 0·25mm. from the middle of its margin against the prothorax to the forward angle; it possesses no hairs, lenticles, or skin-points, but has an elaborate, though faint, sculpture or network of waved lines, dividing it up into small cells. The prothoracic piece of one side is about 0·7mm. long in the middle line against its fellow; it widens outwards for about the same distance to a length of about 0·9mm., and then narrows about equally at both margins to a point, with a total width of about 1·7mm. The dorsal portion has a few skin-points, and a good display of the network of waved lines, but it is only on the outer (lateral) narrowing portion that skin-points and lenticles are present and abundantly so with a few hairs. There are perhaps 28 to 30 lenticles, and a dozen hairs. The diameter of the lenticles is about 0·012mm. to 0·015mm.; the hairs are nearly globular, with bases about 0·006mm. across, and the globe of the hair 0·015mm. to 0·02mm. across; the lenticles have rather faint broad margins, and dotted centres. The globular hairs are very minutely spiculated all over, and belong, though not very typically, to the class of umbrella- or fungus-hairs. The skin-points (rosettes) are numerous, and much darker than the hairs or lenticles; they have a dark (deep brown even when much magnified) centre, about 0·004mm. across, which has a central clear spot; around it is an area of nearly four times their diameter, only faintly different in tint from the surrounding area; indeed, it is probable it only differs in being raised, and therefore thicker; this is nearly circular, but with some trace of petaloid divisions, and is hardly, perhaps, continuous with the skin-lines, or network, but they always occur at places where three, four, or as many as seven lines meet. The mesothorax has a cover for the spiracle of the usual pattern, 0·3mm. long along the suture, by about 0·07mm. across, and consists of the usual forest of mushroom-like hairs apparently soldered together. The mesothorax itself has, throughout, a mesh of curved lines in a net-work, but hairs and lenticles are wanting, and even skin-points are scarce; there is a line reaching backwards from just above the spiracle-cover, along which there is nearly a score, elsewhere they are absent; there is one lenticle about the centre of the dorsum on each side; there is a little irregularity marking the position of wing-spine. The metathorax has nothing beyond the usual mesh of network, except one or two lenticles, and less than a dozen skin-points near its outer margin.

Plate
XXXI.



1. Left angle of prothorax of pupa of Plebeius argus, with cover of prothoracic spiracle × 60.

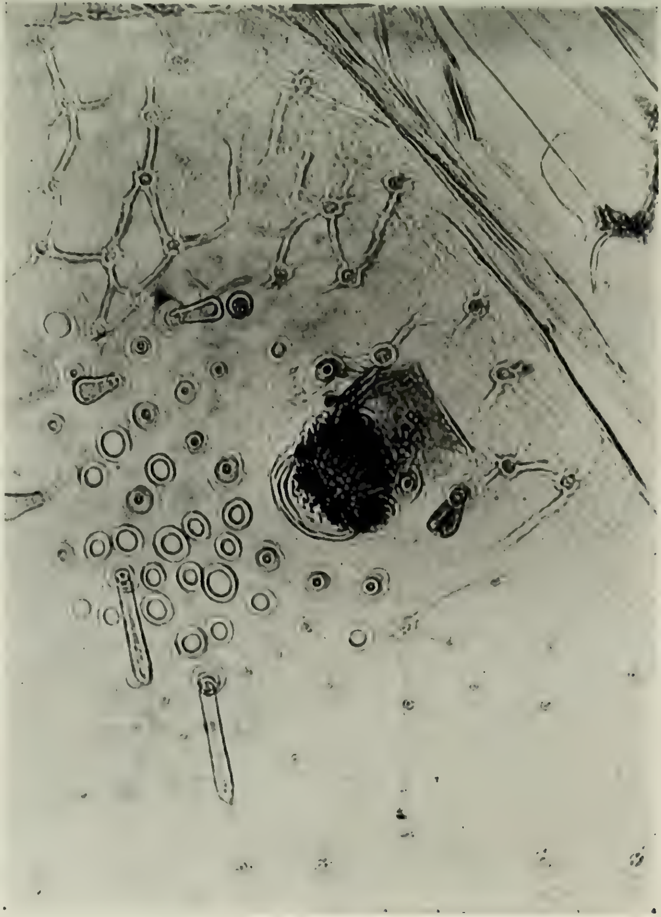


Photo. F. N. Clark.

2. Sixth abdominal spiracle of pupa of Plebeius argus, with two long hairs (the only ones of this kind found in three pupæ), all the others being flask-like as shown × 150.

Pupal structure of Plebeius argus.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 224.]

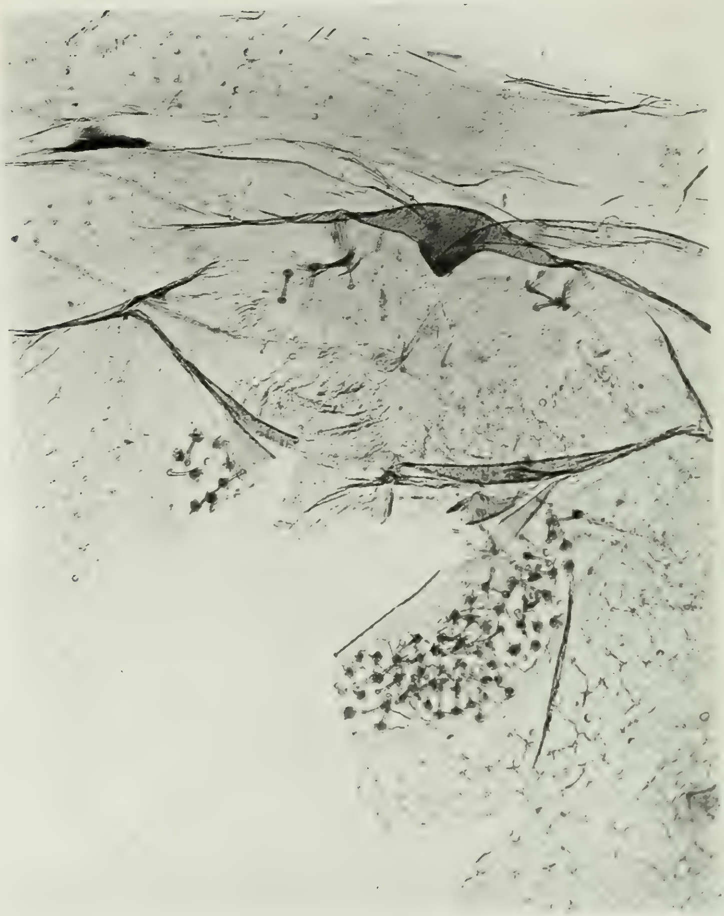


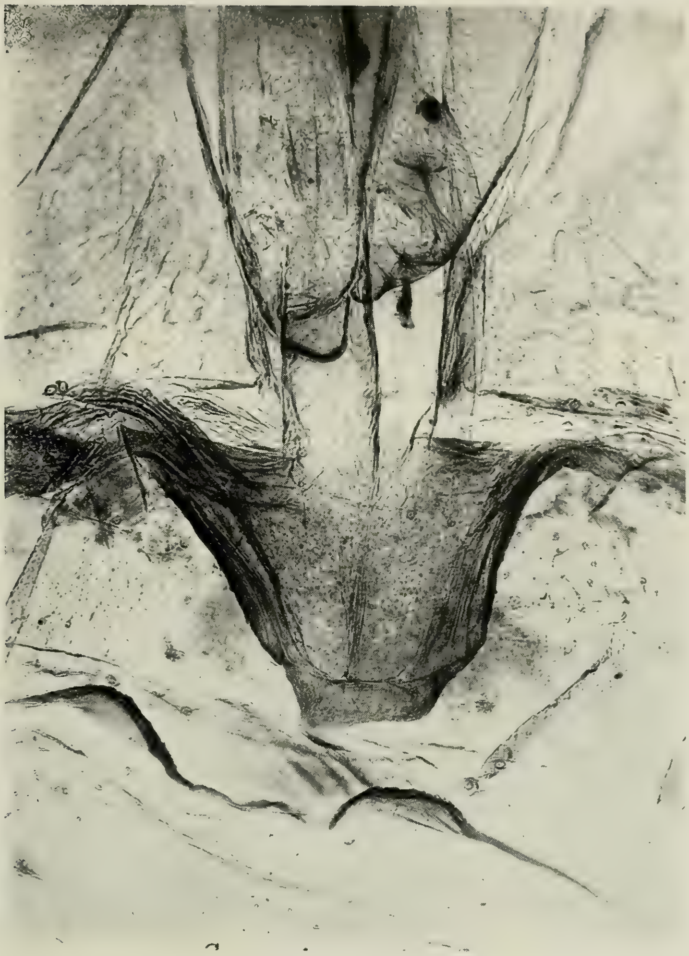
Photo. F. N. Clark.

THE CREMASTER (SPLIT OPEN) OF THE PUPA OF PLEBEIUS ARGUS × 45.

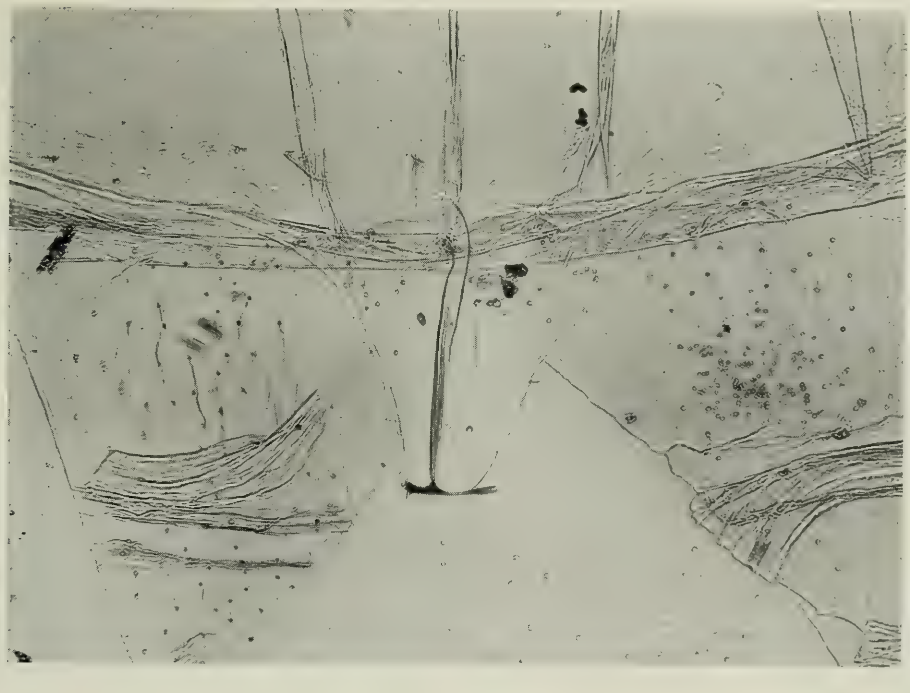
A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 225.]

The angle that is really the hindwing, extends almost to the 3rd abdominal segment; it is marked off by a faint line or fold. The 1st abdominal segment shows the usual network of lines, and also exhibits well the finer network between them that marks, or is at any rate, of the order of dimensions of, the cells that carry skin-points (the usual spiculate ones, not those so-called here for convenience); there are two or three skin-points at either side; it is about 2·3mm. across, and 0·48mm. long dorsally. The 2nd abdominal segment is about 3mm. across, and 1mm. long; it possesses a flight of lenticles above the spiracle, with two or three hairs, and skin-points (rosettes) are well-developed. There are practically no hairs or lenticles except just round, chiefly behind, the spiracles; they are much the same on each of the abdominal segments (2nd to 7th), with the following variations. The lenticles are about 20 round each spiracle, but about 30 on the 6th abdominal, and only one or two on the 7th abdominal; they are largest on the 5th and 6th abdominals; they have a wide, structureless, slightly-tinted margin, and a colourless lumen finely granular; the largest have a diameter of about 0·025mm. The hairs are three or four near each spiracle, of the globular spiculate pattern, about 0·02mm. to 0·03mm. long; on the 6th abdominal segment are several larger ones; in one specimen there are two very globular, pear-shaped, except that the base is very thick, and several others; these large ones are some 0·05mm. long; on another specimen the hairs on this segment are even more developed, several pear-shaped ones nearly as large as those just noted, and two long baton-shaped, nearly 0·1mm. long, and only slightly swollen towards the ends; the 7th segment has five hairs round the spiracle on the first-mentioned specimen, more on the second. There is, therefore, obviously, much variation in the size and number of these hairs in different individuals. The spiracles are oval, about 0·8mm. long, with about 25 lines radiating from the centre, dividing the area into darker and lighter strips, which, in some points of view, look something like ropes, each having some diagonal lines, passing from the centre to the circumference. The 8th segment has merely a spiracular scar with one or two lenticles, and three or four hair-bases, but no hairs beyond an obsolete point. To discriminate between the 9th and 10th abdominal segments, presents the usual difficulties common to Lycænids. Centrally, is a cremastral area carrying some 50 hooks; this is partially marked off by a (sutural ?) line from what is the dorsum of the 9th segment; ventral to it is another transverse suture, and, in front of this, an area with three cremastral hooks on each side of its front margin; these are wanting in one specimen (♂). The anterior ventral margin of the 9th segment carries a small angular projection in the middle of a rather more chitinised margin; in one specimen this projection is about 0·1mm. wide, and terminates in a right angle, its surface being covered with very minute acicular skin-points; in another it is 0·3mm. wide, and has a curved margin; this angular projection is internal, not external; fine acicular skin-points occur also on other portions of this segment. It remains to deal with the face-piece and appendage-cases. The face- (ventral head-) piece, though somewhat angular, nevertheless fills a roughly circular area of about 2·0mm. in diameter, with hollows scooped out for the bases of the antennæ. The mandibles meet in the middle line for about 0·25mm.; above this line is the labrum, the sutures, marking out the rectangular point of which, branch right and left upwards for about 0·3mm. From the end of these lines, the lines of the skin-sculpture radiate on each side; above these lines the labrum, or what seems continuous with it, narrows into what (in the mounted shell) has all the appearance of a funnel-shaped tube, fading out at about 0·3mm. further; this is probably the pharynx or beginning of the œsophagus. On either side of this, about 0·4mm. apart, are two minute lines with apparently a small drawn-out filament attached underneath. The glazed-eyes (about 0·6mm. across the arc) are pale and dotted with eye-points; the area within carries one minute hair, and an obsolete hair-base, and is well-sculptured with netted lines. The face between the labrum and antennæ carries two or three hairs and as many obsolete bases, somewhat irregularly disposed. There are several lenticles and obsolete hairs at a position that might represent the mandibular articulation. The whole surface has a variously-netted sculpture. The maxillæ, each 0·4mm. across at the base, rapidly narrow to 0·2mm., and then, narrowing but slightly, disappear under the antennæ at about 3·5mm., their extremities for about 0·75mm., however, appearing again beyond the ends of the antennæ. And here one notes a very remarkable arrangement, which is quite new to me, though, probably, like other odd structures, once detected, it will be found to be not uncommon, at least in allied species. The extension of the maxillæ beyond the antennæ is quite invisible in the living pupa or the empty case, though the mounted specimen leads one to look for a similar arrangement to that seen in the pupæ of Calophasias, Plusias, etc. Both the antennæ and wings come to the front margin of the 5th abdominal segment, and are there soldered down in the usual way. A little further investigation shows that the maxillary extremities take their further extension inside the pupa-case; they pass inwards by forming a pocket in the intersegmental membrane between the 4th and 5th abdominal segments, and lie just within the ventral face of the 5th segment, their extremities reaching to the 6th abdominal. Searching for a similar condition in other species, I find it is much the same in the pupa of *Plebeius argyrognomon*, and apparently so in *Polyommatus icarus*, *Cyaniris semiargus* (*acis*), and other Plebeiids. I find no trace of it in the pupæ of Ruralids (Theclids), except that, in some Theclids and Lycænids that do not possess it, there is, at the end of the antennæ, a condition a little more than if they merely abutted on the 5th abdominal segment, but rather as if the extremity was a little overlapped. It is apposite to the question of intersegmental membrane, that I detect no indication of any incision possessing movement, or of having recently lost it. The first leg is about 2·5mm. long, and 0·7mm. wide at the widest; this wide portion is very short, the upper portion extending to a sharp point between the eye and antennæ, and the lower dwindling less rapidly to a point between the second leg and maxilla at 2·0mm. from the top of maxillæ. The second leg is about 0·4mm. at widest, just over 2mm. long, and ending in a point at each end, between the antenna and the first leg above, between antenna and maxilla below. The first leg possesses three or four lenticles and an abortive hair at 0·8mm. or 0·9mm. from its lower end. The second leg has several lenticles or aborted hairs at 0·3mm., and again one or two at about 0·9mm. from its lower end. These hairs and lenticles vary a little in



1. FRONT OF 4TH AND 5TH ABDOMINAL SEGMENTS OF PUPA OF PLEBEIUS ARGUS, SHOWING PROJECTION OF MAXILLÆ INTO PUPAL INTERIOR THROUGH THE 4-5 ABDOMINAL INCISION × 60.



2. FRONT OF 4TH AND 5TH ABDOMINAL SEGMENTS OF PUPA OF PLEBEIUS ARGUS, WITH PORTION OF 5TH SEGMENT CUT AWAY, TO SHOW MAXILLÆ PROJECTING INTO INTERIOR OF PUPA, THROUGH 4-5 ABDOMINAL INCISION × 60.

PUPAL STRUCTURE OF PLEBEIUS ARGUS.

position, and also in number, but there is, in all specimens examined, at least one at each situation noted. The antennæ are 7mm. long, and about 0·3mm. wide, with a wider square portion (scape) at vertex. All these appendages are sculptured in the usual fine network of raised lines, but very irregularly. The wings have the network in larger meshes and finer lines. In the empty case, the veins are very evident on the wing-cases, but, in mounted specimens, these are not seen. The hind-margin of the wing is marked by lines due to infringing on the 4th and 5th abdominal segments, and a small border, perhaps, sinks into the incision, but nothing distinctly like "Poulton's line" is seen. I observe I have not noted the acicular skin-points of the ventral aspect of the 5th and 6th abdominal segments. It is very interesting to follow the variations from point to point of the skin-rosettes, and the meshes of net-work, but it would be even more tedious than I am already, to attempt to describe them (Chapman).

Time of appearance.—In Britain the species is entirely single-brooded. Going over the winter as egg, the young larva may emerge any time between the end of February and commencement of May, and, according to its position being suitable or unsuitable, may feed up comparatively quickly or slowly; hence, though the species is rarely on the wing until the last ten days of June, emergences may continue until well into August. There is considerable difference in the time of appearance in early and late seasons, as our detailed list of captures and emergences show. But the species is not so completely single-brooded on the continent; it is, we have no doubt, partially double-brooded in Fontainebleau Forest, where we found the species fully out on June 28th, 1907, and also found a few examples in good condition quite late in August, 1899; similarly, at Grésy-sur-Aix, a partial second-brood appears to occur in mid-August, a few fine examples then occurring where the species is not uncommon in June, which we do not think are merely a continuous single-brood as is the case in Britain. Quite in the south of France, Powell says (*in litt.*) that there is reason to believe the species to be double-brooded, perhaps partially triple-brooded, in lowlying parts of the Mediterranean littoral. He has not tried to breed second-brood examples from the egg, but the fact that *P. argus* is abundant and getting well-worn near the Hyères' marshes at the end of May, and that it is abundant and fresh in the same locality during the second and third weeks in August, is pretty convincing evidence of a second (perhaps third) brood, as he says he has never looked here for *argus* in June or July. Oberthür, however, states (*Etudes*, xx., p. 26) that, near Rennes, it is only single-brooded, occurring at the end of June and beginning of July. It is also noted as occurring in Allier, in May and July (Peyerimhoff); from June 15th-August 30th, in Indre (Sand); in June, on the coast, in Eure (Dupont); common almost everywhere in June and July, up to 6000ft., in the French Pyrenees (Elwes); in June and August in Loir-et-Cher (Chevillon). The evidence available indicates that the species is largely single-brooded in Germany, although some authors suggest a second-brood, *e.g.*, May, and again in July-August, in Eutin (Boie); May and early June, and again end of July-August, in Hanover (Peets), but Glitz gives June to August for the same district; in May and August, in Hesse (Glaser), although

Koch gives June to August, and Schenck, July and August for the same district; in May, and again in July-August, in Baden (Mess-Spuler); sometimes singly end of May, but usually at end of June-July, in Bavaria (Schmid). The greater number of records, however, tally with ours, *e.g.*, June 23rd to end of July, in East and West Prussia (Schmidt); June, July, and August, in Pomerania (Spormann); July, in Mecklenburg (Gillmer); June and July, in Hamburg (Tessien); July 22nd-August 1st, in the Isle of Sylt (Werneburg); end of June to early August, in the Rhine Provinces (Rothke); end of June till beginning of August, in Waldeck (Speyer), and in Anhalt (Gillmer); end of June and July, in Thuringia (Krieghoff); June and July, in the Province of Saxony (Stange); July and August, in the Hartz (Reinecke); also in the Trebnitz mountains (Döring); but June to August, in Upper Lusatia (Möschler); and in the Kingdom of Saxony (*Ent. Ver. Iris*). In Denmark it is recorded as occurring from early June until early August (Bang-Haas). In Finland, it occurs from June to August, but July is the chief month, and, at this time, the species is very common (Federley); in Scandinavia it appears in July and August (Wallengren), Strand took it from late June to mid-August in the Siredal district. In Switzerland, Wheeler notes it as double-brooded, occurring in May-June, and July-August, in the lower parts of the country, but single-brooded only, in July and August, in the mountains. Reverdin says that the earliest date at which he has taken the species in the plain, was at Vengeron near Geneva, a ♂ on May 30th, 1894, the latest, a ♂ at Bois Taille, on August 3rd, 1905; the earliest date in the mountains, at Schallberg, a ♂, on July 8th, 1907; the latest on the Taschalp, a ♀, August 27th, 1907. Rehfous, however, reports it as continuously-brooded near Geneva, between the end of May and September (May 21st-September 1st), this idea of continuous-broodedness, however, requires confirmation; one doubts whether it is in any part of Switzerland more than very partially double-brooded. There appears to be little doubt of its partial double-broodedness in the southern parts of Austria-Hungary, whilst it is no doubt single-brooded in the more mountainous parts, *e.g.*, double-brooded in Croatia (at Agram), the first brood in May and June, the second July to September (Grund); May to August in two broods, but in the mountains July and August, in one brood only, in Carinthia (Höfner); in Bohemia, June and July (Nickerl), but Fritsch says May (26th) and second-brood July (2nd-21st) at Senftenberg; June and July at Brünn (Schneider), but Fritsch gives May 30th-June 5th, at Brünn, May 12th at Kremsier, and June 8th to 21st at Neutitschein; June and July in Upper Austria (Brittinger), where again Fritsch gives May 11th-June 6th (first brood), July 13th-August 25th (second brood), and August 27th-October 14th, last appearance; in the mountains, June and July at Heiligenblut, up to 4800ft. (Richter); from end of June to mid-July, in the Styrian Ennsthales (Kiefer); early August at Schluderbach (Mann). In Bulgaria and East Roumelia, it occurs from May to the end of July (Rebel); in June and July, in Bosnia (Elwes). The Spanish dates suggest, as a rule, a single-brood, *e.g.*, continuously from June 15th-July 15th, 1908, at La Granja (Lowe); early June at Huejar (Nicholson); in July, in Andalusia (Oberthür); neither do our own detailed dates (*infrà*) suggest double-broodedness, *e.g.*, Chapman found it from mid-June to mid-July, in the

Albarracin district; similarly, from mid-June to mid-July, in Galicia, and in July and August at Bejar. In Italy it is probably, at least partially double-brooded in the plains, although, as usual for this country, the knowledge available is limited and indefinite; it is, for example, recorded as occurring throughout July and the first fortnight of August at Boscolungo in the Apennines (Stefanelli); also in June and July at Limone and Tombolo (Schiavazzi); and common in the second part of August in the Vallombrosa (Curò): whilst Rühl gives June and September in the Roman Campagna, and May and August in Lombardy, suggesting two broods; we note May in the neighbourhood of Rome, June at Florence, July at La Prese (White); end of June and early July, at Lucca (Walker); our own records indicate a single-brood only in the mountainous regions of Piedmont, in July and August; Chapman has taken it as early as May at Locarno, and Lowe, in June, at Orta, but we have no indication of a second-brood here. The tiny examples in the Brit. Mus. coll., taken by Zeller in early September in the Roman Campagna (*anteà*, p. 173), would indicate rather specimens of a partial third-brood. In Russia we note it as recorded in June and throughout July in the Baltic Provinces (Nolcken); in June and July in the Riga district (Teich); also in early August on the Gulf of Riga (Druce); June and July, throughout the Wiatka Government (Kroulikowsky); also distributed throughout the Moscow, Kaluga, and Tambov governments, in June and July (Assmuss). There is practically no information available as to whether the species is single-brooded or double-brooded in Asia, and the following general records must be studied in connection with the actual dates noted (*infrà*) by those interested, *e.g.*, the species is recorded as occurring in June at Afka, in Syria (Nicholl); September at Brussa; July in the Taurus Mountains (*teste* Bethune-Baker); early June, in the Khingoob Valley (Grum-Grshimailo); common at Ongodai, and in the Tchuja and Bashkaus valleys, in July (Elwes); common in June and July, in Corea (Leech); in August, on the Isle of Askold (Oberthür), etc. Actual dates recorded for the capture of this species are: In Britain—June 8th, 1844, abundant on the Cliffe Hill, Lewes (Weir); July 10th, 1856, near Emsworth (Buckler); July 15th, 1856, near Dover (Harding); July 21st, 1856, at Witherslack (Hodgkinson); August 6th, 1856, at the Burning Cliff, near Weymouth (Pretor); July 7th, 1857, in Headley Lane, July 10th, 1857, on the long ridges above the precipitous part of Box Hill (Trimen); July 14th, 1857, near Worth (Silvester); July 29th, 1857, at Warsash (Swinton); June 22nd, 1858, in the Dover district (Harding); June 25th, 1858, in the New Forest, common (Farren); June 29th, 1858, at Ringwood (Crotch); June 30th, 1858, in profusion at Norley Wood (Guise); July 3rd-5th, 1858, near York (Prest); July 11th, 1858, on Holly Hill (Chaney); July 16th-17th, 1858, near Green Trees Farm, Tilgate Forest (Tugwell); July 7th, 1861, in great abundance in the New Forest (Farren); July 14th-15th, 1861, in profusion at Whitbarrow Scar (Hodgkinson); June 27th-July 2nd, 1864, at Wokingham (Horton); July 3rd-27th, 1865, at Bournemouth (Knaggs); June 13th, 1868, swarming at Lyndhurst, a very hot summer (A. H. Jones); July 7th-8th, 1870, at Bolt Head (Mathew); very common July 7th-21st, 1870, in the Lizard district (Marshall); July 20th, 1871, at Loughton (Burrows); August 5th-21st, 1871, in the New Forest, abundant

(Lockyer); July 19th, 1873, at Cawston, July 21st, 1873, at Beiston, July 23rd, 1873, at Drayton Drury (Norgate); abundant July, 1874, in the New Forest (Cooper); July 6th-15th, 1874, at Lyndhurst (Bower); August 14th-21st, 1875, August 19th, 1876, July 10th and August 11th, 1877, at Drayton Drury (Norgate); July 30th-August 9th, 1877, in the New Forest (Porritt); between August 7th-September 19th, 1877, at Petersfield (Robinson); continued as late as September 17th, in 1877 (Dale); July 14th, 1878, common at Brandon (Bower); July 12th, 13th, 1881, July 3rd, August 7th, 1882, in the Isle of Purbeck (Bankes); July 7th-10th, 1883, at King's Lynn (Atmore); July 18th-August 8th, 1885, at Matley, Lymington, near Hordle, and on the outside of Ramnor enclosure in the New Forest (Hawes); July 6th-13th, 1887, at Witherslack (Hodgkinson); mid-July, 1888, in Delamere Forest (Arkle); June 25th-July 10th, 1889, at Lyndhurst (Nicholson); July 15th-17th, 1889, at Brockenhurst (Frohawk); June 24th, 1890, at Lyndhurst (Alderson); June 28th-July 17th, 1890, at Brockenhurst (Blagg); July 7th-26th, 1890, at Lyndhurst (Simes); July 13th-26th, 1890, at Lyndhurst (Fowler); July 13th-20th, 1890, at Brockenhurst (James); August 1st, 1890, on Holly Hill, Chatham (Tyrer); August 4th-7th, 1890, at Bournemouth (Bellamy); July, 1891, at Portland (Sheldon); July 15th, 1891, at Lyndhurst (Simes); July 20th, 1891, in Ashdown Forest (Croker); July 20th, 1891, near St. Margaret's Bay (Fenn); July 21st, 1891, at Lyndhurst, August 1st-10th, 1891, near Bournemouth, August 16th, 1891, at Swanage (Alderson); July 28th, 1891, at Bournemouth (Raynor); July 30th, 1891, at Woking (Grover); July 1st-14th, 1892, at Salcombe, on the coast (Prideaux); July 7th, 1892, at Lyndhurst (S. Walker); July 21st, 1892, near Ringwood (Bloomfield); July 22nd-29th, 1892, in the New Forest (Alderson); August 1st-10th, 1892, on the Witherslack Mosses (Massey); August 4th-11th, 1892, in the New Forest (Blathwayt); June 10th, 1893, at Oxshott (Turner); June 11th, 1893, at Abersoch (Arkle); July 1st, 1893, at Frimley near Aldershot (T. Bainbrigge-Fletcher); July 1st-6th, 1893, at Cuxton (Tutt); July 7th-14th, 1893, on the Witherslack Mosses (Massey); June 1st-21st, 1894, at Barmouth (Kenward); June 30th, 1894, at Exmouth (Prideaux); July 9th, 1894, and following days, on Canford Heath, and near Parkstone (Bromilow); July 20th, 1894, on Witherslack Mosses (Massey); July 28th, 1894, at Oxshott (Adkin); one ♂, August 3rd, 1894, near Gourock (Mackieson); June 7th-15th, 1895, at Tenby (Robertson); June 16th, 1895, at Lyndhurst (Bell); abundant by June 29th, 1895, at Salcombe (Prideaux); June 29th, 1895, at Oxshott (Turner); July 8th, 1895, at Shoreham, Kent (Bower); July 13th and 14th, 1895, in fresh condition at Witherslack (Crabtree); July 15th, 1895, on Witherslack Mosses (Massey); August 11th, 1895, at Lyndhurst (Brady); June 7th, 1896, in Carnarvonshire (Blagg); wasted by June 13th, 1896, at Salcombe (Prideaux); June 17th, 1896, at Lyndhurst (Bell); June 20th, 1896, on the banks of the Basingstoke Canal, Byfleet (Turner); June 29th-July 8th, 1896, in the New Forest (Nash); July 12th, 1896, at Oxshott (Moore); July 15th-20th, 1896, in the New Forest (Bayne); August 3rd, 1896, near Tunbridge Wells (Tremayne); June 26th-30th, 1897, at Tenby (Robertson); June 28th-July 4th, 1897, in the New Forest (Atmore); July 4th, 1897, at Woking, July 18th, 1897, at Chertsey (Raynor); July 16th, 1897, at Shoreham, Kent

(Bower); July 17th and 18th, 1897, abundant, and in splendid condition, at Witherslack (Crabtree); July 21st, 1897, at Bolt Head (Sheldon); July 26th, 1897, at Oxshott (Tremayne); July 7th, 1898, on a common between Reading and Burgfield (Rowland-Brown); July 29th, 1898, males only observed, and not many of these, at Witherslack, evidently a very late season (Crabtree); July 31st-August 1st, 1898, at Shoreham (Carr); August 1st, 1898, at Land's End (J. E. Gardner); July 20th, 1899, at Oxshott (Carr); July 20th, 1899, on Witherslack Mosses (Massey); July 27th, 1899, at Oxshott (James); August 3rd, 1899, common, at Woking (Image); June 21st-July 10th, 1900, near Holyhead (Freer); June 30th-July 19th, 1900, in Delamere Forest district (Arkle); July 3rd, 1900, at Lyndhurst, in great numbers (Alderson); July 11th, 1900, at Oxshott (Bird); July 12th-13th, 1900, at Oxshott (Kaye); July 14th-21st, 1900, at Oxshott (Pickett); July 14th, 1900, between Claygate and Esher (Carr); July 15th, 1900, in south Devon (Prideaux); July 15th, 1900, on Witherslack Mosses (Massey); July 15th-22nd, 1900, at Newbury (Hopson); July 17th, 1900, at Ripley (Turner); June 14th, 1901, on the north coast of Cornwall (Rollason); June 23rd, 1901, at Exmouth (Prideaux); June 19th, 1901, at Oxshott (J. E. Gardner); July, 1901, at Witherslack (Mousley); July 3rd-22nd, 1901, at Carbis Bay (James); July 5th, 1901, at Abbott's Wood (Salvage); July 5th and 9th, 1901, at Tuddenham (Norgate); July 7th and 8th, 1901, on the Witherslack Mosses (Johnson); July 10th, 1901, on the Witherslack Mosses (Massey): July 1st, 2nd, August 1st, 1902, in the Isle of Purbeck (Bankes); July 5th, 1902, at Gaddon Down, Cullompton (Angus); July 5th, 1902, near the Wisley Ponds (Lucas); July 6th-15th, 1902, in Ashdown Forest (Bell); July 11th-26th 1902, at Lyndhurst (Vinall); July 12th, 1902, at Carbis Bay (James); July 13th-August 3rd, 1902, near Lower Fant (Golding); July 20th, 1902, only just emerging at Witherslack (Crabtree); July 25th, 1902, at Shoreham, Kent (Bower); August 1st-11th, 1902, at Bank (New Forest), abundant (Carr); August 2nd, 1902, at Burgess Hill (Dollman); August 27th, 1902, at Woking (Image); September 6th, 1902, at Storrington (Bird); June 29th, 1903, at Salcombe (Prideaux); June 30th, 1903, in the Truro district, July, 1903, in the Newquay district (Rollason); June 30th-July 7th, 1903, at Brockenhurst (Hodson); July 11th, 1903, at Delamere (Arkle); July 12th, 1903, in the New Forest (Woodforde); July 25th, 1903, at Oxshott (Pickett); August 1st-14th, 1903, at Brockenhurst (Wright); August 6th, 1903, at Storrington (Bird); June 24th, 1904, in the Isle of Portland (Bankes); July, 1904, at Attlebridge (Barraud); July 2nd, 1904, at Farnborough (Rothschild); August, 1904, at Llanfwrog, in Anglesey (Freer); August 5th, 1904, at Brockenhurst (Oldaker); June 13th, 1905, at Westwell (J. E. Gardner); June 28th, 1905, at Lyndhurst (Young); July 12th, 1905, at Oxshott (Barraud); July 16th, 1905, on the North Downs (A. H. Jones); July 17th, 1905, at Brockenhurst (Bell); July 17th-24th, 1905, at Cuxton (Burrows); July 18th, 1905, at Witherslack (Clutten); July 20th, 1905, at Kendal (Massey); July 20th and 23rd, 1905, at Ashford (Wood); July 8th, 1906, near Newbury (Hopson); June 30th-July 14th, 1906, at Delamere (Arkle); July 3rd, 1906, at Woolacombe (Longstaff); July 4th, 1906, at Haslemere (Oldaker); July 20th and 21st, 1906, not fully out at Witherslack (Crabtree); July 23rd, 1906, at Drayton Drury (Norgate); July 31st, 1906, on

Witherslack Mosses (Whittingham); July 17th, 1907, at Haslemere (Oldaker); August 7th, 1908, at Wimborne (Mathew). The dates recorded for localities outside the British Islands that have come under our notice are—September 3rd, 1844, in the Roman Campagna (Zeller); May, 1866, at Rome, June, 1866, at Florence, July, 1866, at La Prese (White); May 31st.-June 3rd, 1867, at Preth, July 5th, 1867, at Raibl, July 18th, 1871, at Bergün (Zeller); June 28th-July 3rd, 1872, at Lucca (Walker); August 18th, 1872, at Meiringen (Lang); June 30th-July 16th, 1873, at Bergün, June 21st-30th, 1875, at Bergün (Zeller); June 28th-July 5th, 1878, at Zermatt (Jordan); July 8th, 1878, in the Val Fex, between 5500ft. and 8500ft. (Elwes); June 3rd-15th, 1880, in the Visp and Saas valleys (Jordan); June 3rd, 1880, between Coimbra and São Antonio, June 8th, 1880, at Cea, June 14th, 1880, near Ponte de Morcellos (Eaton); June 4th-26th, 1883, at Kreuznach (Elwes); June 23rd, 1883, at Chamonix, June, 1883, at Orsières and Martigny (Bethune-Baker); July 4th-12th, 1883, near Carlsbad (Becher); July, 1884, at Pontresina (Lemann); June 1st, 1885, at Simplon, June 27th, 1885, in the Val Bregaglia (Elwes); June 7th, 1885, at Grünewald (Schultz); July, 1885, at Pontresina (Lemann); July, 1885, at Uriage (Reverdin); July, 1886, in Engelberg (Bethune-Baker); common throughout July, in 1887, to 6000ft., almost everywhere in the eastern and central Pyrenees, July 1st-6th, 1887, at Vernet (Elwes); first seen May 20th, 1889, at Hyères (Norris); June 5th, 1890, at Digne (Jones); June 12th, 1890, at Lachta, July 1st, 1890, at St. Petersburg (Grum-Grshimailo); June 25th, 1890, in the Isle of Jethou (Luff); June 26th-July 6th, 1890, at Engelberg (Baker); August 27th, 1890, at Su-Tcheou- Kansu (Grum-Grshimailo); June 11th-13th, 1891, at Trieste, June 18th, 1891, at Pola (de la Garde): June 21st, 1891, at Servatchowo, June 23rd, 1891, at Lachta (Grum-Grshimailo); July, 1891, at Digne (Lemann); June, 1892, at Budapest (Lemann); June 8th-21st, 1893, in the Budapest district (Nicholson); June 15th, 1893, at Vizzavona in Corsica (A. H. Jones); June 15th, 1893, at Tattone, June 22nd, 23rd, 30th, July 6th and 21st, 1893, at La Foce (Yerbury); May 20th, 1894, at Vengeron, July 18th, 1894, at Randa and Zermatt (Reverdin); July, 1894, at Vernet (Lemann); July 17th, 1894, at San Martino (Knecht); August 1st-10th, 1894, above Courmayeur (Tutt); June 2nd, 1895, at Vengeron, July 27th, 1895, at Divonne (Reverdin); June 4th, 1895, above Huejar (Nicholson); July 15th-20th, 1895, at Campiglio (Chapman); July 26th-August 2nd, 1895, at Mendel (Tutt); June 14th, 1896, on the hills of Deux-Amants (Dupont); July, 1896, at Göschenen (Tutt coll.); July 20th-August 16th, 1896, in the Hautes-Pyrénées (Bath); July 23rd, 1896, at Grésy-sur-Aix, July 30th, 1896, at St. Michel-de-Maurienne, August 5th-12th, 1896, above the village of Les Fréaux (Tutt); August 2nd, 1896, above Les Avants-sur-Montreux, August 13th, 1896, between Useigne and Evolène (Rowland-Brown); June 3rd-14th, 1897, at Veytaux, August 6th, 1897, at Bérisal (Wheeler); June 14th-21st, 1897, at Cuenca, June 30th-July 21st, 1897, at Albarracin (Nicholl); June 17th-25th, 1897, in Fontainebleau Forest, August 1st-4th, 1895, above St. Michel-de-Maurienne, August 3rd-8th, 1897, at Lanslebourg, August 11th-18th, 1897, at Susa (Tutt); July 17th, 1897, at Kor Alpe (Chapman); July 17th, 1897, at Wolfsberg, July 29th-30th, 1897, at Sterzing (Lemann);

August 5th, 1897, at Vladimir Bay, Russian Tartary (Lang coll.); June 11th-13th, 1898, at Trieste (de la Garde); June 18th-July 1st, 1898, at Ongodai (Jacobson); June 20th-July 2nd, 1898, at Saeterstoen (Chapman); July 20th-30th, 1898, near the Ganter Bridge (Wheeler); July 26th-30th, 1898, in the Bashkaus Valley (Elwes); July 26th, 1898, at Randa (Reverdin); July 25th-26th, 1898, at Grésy-sur-Aix, July 28th-August 1st, at Bourg St. Maurice, August 3rd-12th, 1898, above Pré St. Didier, in the Val Ferrex and Val Véni (Tutt); August 1st-25th, 1898, at Zinal (Rowland-Brown); May 21st, 1899, on the slopes of the Vitoch, July 8th, 1899, near Samakov (Nicholl); June 5th, 1899, in the Bois du Rocher Coupé, Digne, June 21st-30th, 1899, around Susa (Rowland-Brown); June 18th-23rd, 1899, at Digne, June 25th, July 15th, 1899, in the Vallon Obscur, Nice, June 28th-July 7th, 1899, at St. Martin Vésubie, July 9th-14th, 1899, at Vizzavona and Bastia, July 17th, 1899, at Annot (Lang); July 28th-August 4th, 1899, on the Simplon, August 20th-23rd, 1899, in Fontainebleau Forest (Tutt); July, 1899, on the Riffel Alp (Lemann); July 1st-13th, 1899, in the Zermatt valley, Tasch, Randa, Visp (Rosa); July 1st-12th, 1899, at Fusio, July 16th-20th, 1899, at Macugnaga (Chapman); July 8th, 1899, on the Rilo Dagh, at 4600ft. (Elwes); July 9th, 1899, onwards, in the Val André (Turner); July 15th-August 25th, 1899, in the Brenner district (Galvagni); May 12th-June 16th, 1900, at Orta Novarese (Lowe); June 15th, 1900, at Bouveret (Wheeler); June 17th, 1900, at Christiansand (Morton); July 1st-20th, 1900, at Pontresina, July 21st-30th, 1900, at Guarda (Chapman); July 29th-August 7th, 1900, at Larche, August 18th-24th, 1900, at Grésy-sur-Aix (Tutt); July 7th-21st, 1900, on the Simplon (Rosa); July 21st-August 9th, 1900, in the Brenner district, July 22nd, 1900, in the Navis Thal at 1276m. (Galvagni); May 23rd, 1901, at Bouveret, July 11th, 1901, in the Steinenthal (Wheeler); June 20th-25th, 1901, at Botzen (Lowe); June 28th-July 1st, 1901, at Jaicé, July 1st, 1901, at Jesero, Bosnia (Elwes); June 28th, 1901, at Entrevaux (450m), July 13th, 1901, at Colmars (1500m.-1800m.), July 19th-23rd, 1901, at Beauvézer (1200m.) (Powell); July 9th-16th, 1901, at Cuenca, July 18th-26th, 1901, at Tragacete (Chapman); July 16th-25th, 1901, at Florac (Rowland-Brown); August 9th-18th, 1901, between Bobbie and the Pellice Falls, August 18th-22nd, 1901, above Au Pra (Tutt); May 14th-June, 1902, at Locarno, July 9th, 1902, at Bejar (Chapman); May 26th, 1902, worn on June 6th, 1902, but several fresh June 12th, 1902, in the Gapeau Valley near Hyères, at sea-level, July 15th-18th, 1902, at St. Martin Vésubie (950m.) (Powell); June 2nd, 1902, at Bouveret, (Wheeler); June 16th-21st, 1902, at Susa (Lowe); June 26th-30th, 1902, at St. Georges (Wheeler); June 16th-21st, 1902, at Susa (Lowe) June 26th-30th, 1902, on the hillside near Engleville, by the Forest of Arques (Moore); June 26th-July 1st, 1902, at Sireosen, July 1st-12th, 1902, in the Siredal, July 18th-20th, 1902, at Tou, August 10th, 18th, 1902, at Ose (Strand); June 27th, 1902, between Martigny and Vernayaz, June 28th, 1902, at Branson, July 6th, 1902, in the Ganter Valley (Sheldon); July 5th-30th, 1902, at Villars (Moss); August 5th-12th, 1902, between Megève and St. Gervais (Tutt); June, 1903, on the top of the Lokman near Amasia, very abundant (Fountaine); June 3rd, 1903, at Bouveret, July 21st, 1903, at Bérisal, July 21st, 1903, in the Ganter-Thal, July 22nd, 1903, in the Laquinthal (Wheeler); June 29th, 1903, on the Trubsee Alp (Keynes); July 1st, 1903, fine, July 18th, still fresh, July 26th, 1903, worn in the Buchholz, at Schwerin (Gillmer); July 1st-7th, 1903, at Entrevaux (450m.) (Powell); July 7th, 1903, at Gondo (Muschamp); July 14th, 1903, near Martigny, July 27th, 1903, in the Laquinthal (Sheldon); July 14th, 1903, near Bérisal (Walker); July 16th, 1903, at Bérisal, August 1st, 1903, at Alpienalp (Reverdin); July 26th, 1903, at St. Martin Vésubie (Rowland-Brown); July 29th, 1903, in the Combe d'Arolla (Tutt); July 2nd, 1904, at Nikko, July 11th-12th, 1904, at Asahigawa, Hokkaido, August 1st-3rd, 1904, at Kisagawa (Elwes); July, 1904, at Ste Croix, July 24th, 1904, on Col Ferret, September 4th, 1904, at Geneva (Muschamp); July 7th, 1904, at Brides-les-Bains, July 10th, 1904, at Salins (Reverdin); July, 1904, at Innsbruck (Lemann); July 9th-19th, 1904, at Tattone (Rosa); July 11th, 1904, onwards, in the Campiglio district (Rowland-Brown); July 14th, 1904, at Martigny (Blachier); July 17th-20th, 1904, at Digne (Sheldon); July 21st, 1904, exceedingly abundant, but worn in the Buchholz at Schwerin (Gillmer): July 27th, 1904, at Rudersdorf, August 17th, 1904, at Bernau (Dadd); July 31st-August 7th, 1904, above Courmayeur (Tutt): May 15th, 1905, at Geneva, July 4th, 1905, on the Simplon, July 10th, 1905, at Campolungo, August 27th, 1905, at Grammont (Muschamp); June 16th, 1905, at Versoix, July 14th, 1905, at Brides-les-Bains, August 3rd, 1905, at Bois Taille, August 18th, 1905, at Randa (Reverdin); July 18th, 1905, in the Vallon de Thoulouse, July 15th-24th, 1905, on the Col de Scalella (Powell); June 21st, 1905, at Martigny, July 8th and August 19th, 1905, on the Simplon, July 16th, 1905, at Zermatt, July 25th, 1905, at Bérisal, August 9th, 1905, in the Val d'Antigorio (Blachier); June 27th, 1906, at Divaca and St. Canzian (Romieux); June 21st, 1905, in the Pfynwald (Pearson); June 16th, 1905, at Oberstdorf, June 27th, 1905, in the Oythal (Dadd); June 28th-July 13th, 1905, at Kleine Scheidegg, July 14th, 1905, and following days between Aigle and Sépey (Moss); July 7th, 1905, in the Schelfwerder (Gillmer); July 14th, 1905, at Guéthary near Biarritz (Sheldon); August 1st-5th, 1905, at Bourg St. Maurice, August 9th-13th, 1905, above Pré St. Didier, August 14th-16th, 1905, above Val Tournanche (Tutt); May 21st, 1906, at Ceinturon, near Hyères, bred June 24th-30th, 1906, from larvæ beaten May 26th, 1906, at Glacière de St. Pons (800 m.), June 26th, 1906, near Levens (400 m.-500 m.), June 30th, and July 2nd, 1906, at Entrevaux (450 m.), July 2nd-3rd, 1906, at Puget-Theniers (360 m.), July 7th, 1906, at Daluis (600 m.-700 m.), July 12th, 1906, in the valley below Rubion, worn; small mountain form above Rubion same day, fairly fresh (Powell); June 18th, 1906, at Vigo, July 1st-7th, 1906, at Brañuelas and Casayo (Chapman); July 4th 1906, at Ostersund, July 27th, 1906, at Fjosanger, near Bergen (Rowland-Brown); July 10th, 1906, at Binn (Blachier); July 14th, 1906, in the Wornitz, on the border of the Mosigkau Haide, in Anhalt (Gillmer); July 30th-August 2nd, 1906, at Clelles (Tutt); August 6th, 1906, at Geneva (Muschamp); August 28th, 1906, on the Taschalp (Reverdin); May 30th, 1907, near Sion (Tetley); June 5th, 1907, at Geneva, July 25th, 1907, on the Dent du Midi (Muschamp); June 6th, 1907, at Kelenföld (Jones); bred June 26th, 1907, from larvæ from Ste, Baume (Powell); July

8th, 1907, at the Ganter Bridge, July 10th-11th, 1907, in the Laquinthal, July 12th, 1907, at Alpien, July 13th, 1907, on the Rossboden Alp (Rehfous); June 14th, July 28th, August 1st, 1907, at Tattone (Faller); June 11th, 1907, at Uzes, June 16th, 1907, at Giens, June 15th, 1907, at Carqueiranne, June 17th, 1907, at Lavandou, June 24th, 1907, at Digne, July 16th, 1907, at Airolo, July 19th, 1907, at Fusio (Blachier); July, 1907, at Monterfil (Oberthür); June 20th, 1907, in the Bois des Frères, July 8th, 1907, at Schallberg, July 11th, 1907, at Branson, July 12th, 1907, on the Alpien Alp, July 14th, 1907, at Gondo, July 25th, 1907, at Randa (Reverdin); July 9th, 10th, 1907, in the neighbourhood of the Lac de Mouriscot, near Biarritz, very common (Keynes); July, 1907, at Pontresina (Bethune-Baker); July 10th, 1907, at Vizzavona (Faller); July 31st, 1907, in the Goeschenen Thal, August 2nd, 1907, at Brugnasco, August 4th, 1907, at Piotta (Tutt); August 8th-13th, 1907, at Champèry, August 15th-22nd, 1907, at Evolène (Page); August 14th-25th, 1907, in Bihar C. at Czehtelek, and August 30th, 1907, at Bishopsbad (Rothschild); May, 28th, 1908, at Allondou (Reverdin); May, 1908, in Hajdu C. at Nadudvar, June 18th, 1908, in Sopron C. at Csorna, July 21st, 1908, in Verzprem C. at Also Ors, July 27th, 1908, at Almadi, September 23rd-25th, 1908, in Bihar C. at Czehtelek (Rothschild); June 2nd-8th, 1908, between Budafok and Kelenfold, June 10th-14th, 1908, at Cserna (Rosa); June 3rd, 1908, at Stäfa, July 20th, 1908, at Klönthal (Glarus) (Muschamp); June 11th, 1908, at Versoix, August 9th, 1908, at Steinenalp (Reverdin); June 14th-17th, 1908, at Carcanières (Jones); June 21st-July 16th, 1908, at La Granja (Lowe); June 28th-August 3rd, 1908, at St. Maurice-sur-Moselle, July 7th, 1908, at Le Tholy, July 29th, 1908, at Charmes (Gibbs); June 28th, 1908, on the lower slopes of the See Alp (Dadd); August 9th-10th, 1908, above Lavin August 14th, 1908, on the Ofen Pass, above Zernetz (Tutt); August 23rd, 1908, at Ceinturon, near Hyères, in fine condition (Powell).

Habits.—Among the rough herbage of the chalk downs, where, for perhaps 500 or 600 square yards, patches of brambles form an almost impenetrable tangle two or three feet in height, with bushes of dog-wood, hawthorn, and blackthorn, and tall masses of golden-flowered *Senecio jacobaea*, purple *Echium*, and pink-flowered *Ononis* interspersed, whilst the slopes around are covered with an abundance of short herbage, including *Helianthemum*, *Lotus*, *Anthyllis*, *Ornithopus*, etc., a fairly quick-flying blue, darts smartly from one place to another, and then suns itself with open wings, or busily sucks a nectarial draught. You are inclined to pass it for *Polyommatus icarus*, but the species is *Plebeius aegon*. Late in the afternoon the same butterflies may be seen preparing for the night's rest, usually rather high up on the chosen plant, sitting head downwards, the abdomen considerably lifted from the resting-surface, the forewings tucked very deeply down between the hindwings. In August, 1908, some specimens were observed on the slopes between Lavin and Guarda, in the Lower Engadine, one afternoon when the sun disappeared repeatedly behind heavy cumulus clouds, flying very gently only whilst the sun shone; in colour on the wing, the males, much darker than those of our home chalkhills, were not unlike small *Cyaniris semiargus*, settling on leaves, and working themselves round until they rested with the head downwards, the forewings drawn back well into the hindwings, and the antennæ well out in front and away from each other. A large ♂ flew on a flower of *Epilobium*, and, as usual, was soon resting head downwards; but another ♂, observed almost at the same time on the flower-head of a large Umbellifer, faced the sun, head upwards, for some time; another ♂ was busily feeding at a labiate plant with red flowers, and was also resting head upwards; one suspected that the nature of the flower necessitated this, but the next day a ♂ was observed settled on a flower of eyebright, the head held downwards, but sitting so that the sun shone full on it, when it opened its wings at about right angles to sun itself; it then worked its way to the various florets all round the flower, probing every floret for nectar. Even in full sun the insect did not appear to be very swift on the wing, nor to fly any great distance; indeed, it seemed much less active than we have seen our large race of the Kentish chalkhills. The same day a ♂ was sitting on a stone near a spring in the sun, and busily moved its wings up and down in the usual manner; as we sat watching it, it flew on our hand, and, although disturbed, came back again, staying there, turning round, exposing its wings to the sun, and moving the hindwings up and down for at least two minutes; it certainly does not seem at all a shy insect. At the same time there were many other ♂ s drinking at the water with *Agriades coridon*, *Hirsutina damon*, etc. The ♀ s on the banks are much more difficult to see than the ♂ s when on flight, and appear not unlike small examples of *Aricia astrarche*. At rest it seems to be almost absolute, that the species prefers to sit head downwards. When the ♂ is, however, in attendance, upon the ♀ s, amongst the short herbage, its flight appears to consist of a continued series of short flutterings almost in a straight line, the wings drawn well up over the back, and falling very little at each forward movement. As already noted, the ♂ s love, in the Alps, to sit and swill at the puddles in the hot sun, and it often happens that they must come some little distance for their drink. At Clelles, in 1906, a large number of ♂ s were taken at a very wet and muddy spot, the overflow of a supply of water to a house, in the village itself, but not a single specimen was observed elsewhere in the district; at Brugnasco, in August, 1907, they were not uncommon at the tricklings across the path, which were crowded with an abundance of *Plebeius argyrognomon*, *Agriades coridon*, *Hesperia alveus*, *Adopaea lineola*, etc. The early ♂ s always seem to be on the wing a few days before the ♀ s, at least this is so on the downs at Cuxton, and Doubleday observes (*Ent.*, iii., p. 36) that the insect swarms in certain spots by the side of Epping Forest, but one cannot find a ♀ till the ♂ s have been out at least a week, but when they do emerge from the pupæ, they are readily seen, as they sit on the stems of grass, etc., expanding their wings. Similarly, Crabtree notes that, on the mosses at Witherslack, the ♀ s emerge a full week later than the ♂ s, with, of course, odd exceptions, an early ♀ being occasionally seen. Lowe states (*in litt.*) that, at La Granja, the species was out on June 15th, in fair numbers, and continued to appear in increasing abundance to July 15th, at first chiefly, if not entirely, ♂ s, but, at last, the ♀ s seemed to predominate. Powell says that, in Corsica, where the species is locally very abundant, the ♀ flies but little, and her flight is very heavy, but that, in spite of the numbers, it is not easy to get a series of fresh ♀s, for as soon as they emerge, they are surrounded by swarms of ♂s, and in a very short time are knocked about and worn. The ♂s fight, he adds, a good deal and show wear and tear rapidly, particularly in the fringes. A ♂ and a ♀ observed paired at Sus, were purposely disturbed, when the ♂ was noticed, in accordance with the habit of other "blue" species, to carry the ♀. Gillmer states (*Insekten Börse*, xxiii., p. 136) that, on July 14th, 1906, he accidentally observed the courtship and pairing of a couple of *Plebeius argus*. Both insects whirled round for a short time in the air, about two and a half feet above the ground, and then, apparently wearied with their violent flight, alighted on the ground on a dry twig beneath, of the thickness of a lead pencil, and about a foot long. The ♀ alighted on the upperside of the twig, near its end, followed by the ♂, and then, in consequence of the crowding up of the ♂, who was trying to reach the side of the ♀, went over on to the side of the twig. This was the favourable moment for the ♂. He now ran beside the ♀, back over the greater part of the twig, and, much as the ♀ apparently tried to avoid him, the ♂ had immediately caught the end of the abdomen of the ♀ with his clasps (harpagones), and the pairing was thereby effected. This, therefore, occurred sideways, whilst the two insects were moving along beside each other. After the lapse of a few seconds, whilst the union between the two insects was becoming secure, a change took place in their mutual position, when the ♀ moved quickly round, and thereby took a position facing in the opposite direction to the ♂. So far as the observer could see, this change was accomplished by the ♀, since the ♂ had not altered the direction in which he was facing, in consequence of the change. The insects, unsettled after their change of position, then made, at the instance of the ♀, some short excursions back over the twig, and entirely in the direction of the ♀, which dragged the ♂ a short distance with her, so that he was obliged to walk backwards, after which no change took place in their position. The whole occurrence only lasted a few minutes, and took place in full sunshine. Before the pairing was effected, both sexes had the wings partly open, but sometimes closed for a short time, afterwards those of the ♀ were closed, those of the ♂ sometimes half-opened. A gust of wind carried the pair to a distance of some mètres from their pairing place, when the ♂, so far as could be seen, carried the ♀; the pairing continued unbroken. We have ourselves seen the species busily feeding at various flowers, although it is not attracted so greatly as are some of its near neighbours. We have seen it with *Polyommatus icarus* at the flowers of *Centaurea nigra* at Cuxton, on flowers of lucerne at Bourg St. Maurice and Grésy-sur-Aix, on blossoms of *Calluna vulgaris* in the Göschenen-Thal, etc., whilst Gillmer observed it sitting in dozens on bramble-blossoms in the Buchholz, at Schwerin, on July 21st, 1904. Gillmer notes (*in litt.*) that, in Anhalt, the species is on the wing only in sunshine, resting quite immovably on dull days; it loves to bask in the sunshine, expanding its wings to one-half or three-fourths, and moving the hindwings under the forewings, at least in the ♂. It usually rests near the ground, on grass, heath, spurge, or dry branches of pine lying on the ground. It is also attracted to flowers, and loves to suck the nectar of the flowers of *Polygala vulgaris*. Its habit of resting gregariously at night has often been remarked upon, and, at such times, the ♂ s often appear to be fairly conspicuous, resting high up on the plants, where they can be readily seen. Thus it is reported as being observed on Gaddon Down, near Cullompton, swarming on the flowering-heads of *Avena flavescens*, where they had gone to rest (Angus); swarms also amongst the long grass, on which it passes the night, in the Isle of Portland (Richardson), and Rollason records the species as swarming in a sheltered valley on the north coast of Cornwall, on June 14th, 1901, whilst at sundown they were observed asleep on the grass stems. It is also noted as sitting at night on the topmost twigs of the ling on the heaths at Wokingham (Horton), and at rest in numbers on the heather at Oxshott (James). Arkle records that, in the Delamere Forest district, it was in hundreds on June 30th, 1900, all ♂ s, flying in company with *Polyommatus icarus*, the ♀ s had become equally abundant by July 19th, when both sexes were observed about 5 p.m., asleep on the heather-tops, in every case resting head downwards; at the same place, on July 14th, 1906, they were again seen, in fine condition, resting at sunset, in scores, head downwards, on an unusually prominent furze-bush, whilst, on June 11th, 1893, the insect, which was swarming on the heaths and sandhills at Abersoch, was, by 7 p.m., conspicuously seated on the marram grass, some two dozen being counted in a square yard. Prideaux observed it at rest in dull weather, in very great numbers, on bracken fronds, in its South Devon resorts.

HABITATS.—A species that exists in suitable places from the marshes of the Mediterranean littoral in the neighbourhood of Hyères, the arid plains of Spain, the shores of the Baltic Sea, and the moorlands of Finmark, to the altitude of the Riffel Alp, and from Ireland through every country of Europe and Central Asia to Japan, is not likely to be found wanting in great variety in its habitats, if sufficient enquiry be made concerning them. In Britain, the species may be said to prefer three very distinct and different kinds of places for its home. In the south of England it usually occurs either on the rough, uncultivated patches that are so frequent on the great ranges of chalkhills that dominate large portions of our southern counties, or on the great tracts of heather-covered gravel and sand that are so locally abundant, and reach their maximum probably in the New Forest district; it also haunts similar localities in other parts of England, Ireland and Scotland, but, in the northern counties of England, it is particularly attached to the moorland bogs that are so frequent among the heathery-covered slopes of our northern mountains. Occasionally, as noted by Lewin, it occurs in low rushy meadows, whilst, on the continent, the corner of a quiet flower-covered pasture, or of a little disturbed lucerne patch is often its chosen haunt, and it sometimes swarms on the lower pastures of many of the alpine valleys of central Europe. It is also found in Britain on wild commons, especially if broom or heather be abundant, but it is a local species, and is often strangely and inexplicably circumscribed within a small spot, when acres of similar-looking ground is apparently within easy access. Above Halling, a typical chalk-down locality consists of a rough slope covered with bramble, scabious, ragwort, sainfoin, and numberless other chalk-loving plants in tangled confusion, and it occurs thus in many places on the chalk-hills on both sides of the Medway; it also occurs on the long ridges above the precipitous parts of Box

Hill (Trimen), on the chalk downs of the Maidstone district (Goodwin), and Eynsford (Battley), and in a rough field at Kingsdown (Cardew). It is recorded on a grassy slope close to the sea, near Swanage, where it occurs with *Agriades coridon*, *Aricia astrarche*, *Polyommatus icarus*, *Hipparchia semele*, *Pararge megaera*, and hundreds of *Thymelicus acteon*, whilst it is also very abundant all over the Lizard promontory, much more so than *Polyommatus icarus* (Riding). It swarms in the Isle of Portland, away from heath, amongst long grass on which it usually passes the night (Richardson). It occurs on the chalk near Chichester (Sperring), and also at Guildford, but is much more abundant on the grassy heaths at Witley (Champion). It abounds on the wild heaths on the outskirts of the New Forest, and, indeed, on heaths throughout the whole county of Hants, an extension, as it were, of those heaths in Surrey, on the Bagshot Sand, on which it is also so abundant. It is to be found in great numbers on the heaths at Lyndhurst, at Oxshott, Woking, Newbury, as well as the heaths of the Isle of Purbeck. It also occurs on heaths in the King's Lynn district (Atmore), on a breezy heath towards Broadwater Forest near Tunbridge Wells (Tremayne); it swarmed in the middle of June 1868, near Tunbridge, occurring in thousands (Cox); is common among *Erica cinerea* at Woolacombe (Longstaff); abundant on the common on the east side of the road at Ripley (Turner); also on the Gaddon Down heath near Cullompton (Angus); on a common near Storrington (Bird), etc. Ellis also records it as occurring among the heather and gorse on Bidston Hill, and Day, that it swarms on the sandhills at Abersoch; on June 11th, 1893, at Abersoch, it swarmed on the heaths and sandhills, where the specimens are much larger than in Delamere Forest, or on the Lancashire mosses. It is noted as plentiful in the open boggy places of Woolmer Forest (Barrett), local in marshy places in the Isle of Wight (Pristo), whilst the beautiful local race *masseyi* is found in the wet mosses of Witherslack, that cross the borders of North Lancashire and Westmorland; Massey says that the insect flies only in the wettest part of the mosses. It may be here noted that Teich records it as a "moorland" insect in the Riga district, but its habitats abroad are even more varied than in Britain, and Nolcken says, that it occurs generally in the Baltic Provinces on heaths and in wood-clearings. In Belgium it is widely distributed but locally abundant, occurring commonly in wood-clearings at Beez, and in waste places near Hannut, etc. In Germany, it occurs from sea-level to the tree-limit, haunting clearings, heaths, meadows in woods, and mountain-meadows (Speyer). The choice of heaths appears to be as frequent in Germany as in Britain; thus we find it recorded as being everywhere frequent in Pomerania where *Calluna vulgaris* grows, on the outskirts of open pinewoods at Warsaw, Carolinenhorst, etc., by roadsides at Nemitz, etc. (Hering), everywhere choosing dry situations, *e.g.*, sunny clearings on the edge of pinewoods, or sunny meadow slopes (Spormann); in Mecklenburg, it prefers the dry, sandy, warm heaths of the Buchholz, at Schwerin, although found singly on the neighbouring marshy districts, whilst at Parchim it also haunts the heaths (Gillmer); it is abundant on the heath and sandy district between Schwerin and Ludwigslust, and in a similar situation in the forest of Mestlin, but occurs not rarely on the moss near Tarzow (Schmidt); it is also very common on the Wesloe moss at Lübeck, as also on the heath at Paling (Tessmann), In the Isle of Sylt, in the North Sea, it occurs everywhere on dry, heathery, and sandy wastes, whilst in Denmark it occurs everywhere on heaths and mosses. In Hanover, it frequents heaths (Glitz), and meadows (Peets), whilst, in the Rhine Provinces, the heaths of Hilden, Krefeld, etc., are particularly noted. In Anhalt, it occurs on the heaths and in the forest openings of the Mosigkau Haide, the banks of the railway (Amelang), the meadows of the Hirtenhau, but, at Wörnitz, in a sandy district, covered with pines and overgrown with heath, at Brachmeierei, its habitat is a more open sandy heath-covered place, with quite young pines (Gillmer); in Brunswick it is very common on heaths (Heinemann), and, in Silesia, it chooses dry stony localities in the Trebnitz mountains, but in the plain and on the low foothills, it chooses dry heaths (Wocke). It is also noted as being especially abundant on heath in the Kingdom of Saxony (Steinert), and Saxonian Upper Lusatia (Schütze). In Bavaria it prefers the borders of forests overgrown with heath and broom (Schmid), but also affects pastures on gravelly soil, with sunny position and sparse vegetation (Kranz), whilst it is noted as occurring in meadows at Kempten (Kolb). In the Bavarian alps, however, it occurred abundantly on an extensive sandbank thrown up by the river near Oberstdorf, and overgrown with willow and other bushes, in company with *Plebeius argyrognomon*, *Cupido minimus*, *Lycaena arion*, *Cyaniris semiargus*, *Agriades bellargus*, *Polyommatus icarus*, etc., whilst, at the junction of the Oy and Trittach, two fine mountain torrents, a sunny bank was alive with butterflies, among which *Plebeius aegon* was found with *Lycaena arion*, *Chrysophanus hippothoë*, etc. (Dadd). In East and West Prussia it is said to prefer meadows and woods (Speiser); in Hesse, wood-clearings, but is especially abundant in the clover-fields and meadows of the Niedgau (Koch), and in open forest land and pastures, specially choosing open, grassy, and flowery pastures, meadows and clover-fields at Darmstadt, etc. (Glaser); at Waldeck it haunts grassy, flower-covered slopes (Speyer). and, in Thuringia, is found in the forest glades of Gera, and the open heaths in the forest near Ossig, etc. (Wilde). In Brandenburg it is said to haunt meadows (Kretschmer), and wood-clearings (Herrmann); at Bernau, it was found commonly on a piece of waste ground covered with thistles, near to which the heather was just commencing to bloom, in company with *Plebeius argyrognomon*, *Heodes virgaureae*, *Loweia dorilis*, *Rumicia phlaeas*, *Adopaea flava*, *A. lineola*, etc. (Dadd), whilst in Posen it is said to choose forest glades and fields (Schultz). In Baden, it is abundant in the plains around Lahr, and especially so on the banks of the Rhine (Keynes). Gillmer further notes that, in Anhalt, the moorland form of the species is rare, the heath form abundant, the latter flying in the paths of the sandy heath and pinewoods, at the time that *Calluna vulgaris* forms a very fine covering of green herbage; it appears to be remarkable that the heath form does not extend into (or even fly into) the grassy and moist parts of the woods in the neighbourhood. In Austria, it is reported as occurring in meadows in Bohemia (Nickerl), in almost all wet and marshy meadows in Salzburg, as well as the Leopoldkron peat-bogs, and the Söllheim moss (Richter); it appears to occur everywhere in the mountain valleys of the Tyrol, as high as the woods extend, occurring on the valley slopes, as high as Franzenshöhe in the Trafoi-thal; whilst we found it on the slopes of the Mendelstrasse, up to the Mendel-pass (Tutt); whilst, in Carniola, it is also reported as occurring on the grassy sides of the mountain valleys (Mann). In France, we have found the species in a variety of habitats. It swarms on the heaths of Fontainebleau Forest, acres of ling growing in the open spaces with breaks of timber between. Far different are its habitats along the foothills at Grésy-sur-Aix, where it haunts the edges of the lucerne meadows, often trespassing into the adjacent vineyards, whilst a favourite haunt, almost on the top of the hills, above the woods, is a famous butterfly-corner, a small stretch of grass, with some bushy plants of lucerne, and here and there a walnut-tree, where, in August, it flies among *Agriades coridon*, *A. bellargus*, *Polyommatus hylas*, *P. icarus*, *Aricia astrarche*, *Everes argiades*, *Cyaniris semiargus*, and a host of larger species ; very similar is its habitat at Bourg St. Maurice, where it swarms in the corner of a meadow where scattered bushes of lucerne grow under the tall hedge that skirts it, whilst the hum of the Torrent des Glaciers comes up the slopes that steeply fall thereto. Very different is the wide wild stretch of stony waste, on which the insect abounds between St. Michel-de-Maurienne and Valloire, and the hard stony slopes, covered with *Onobrychis sativa*, where it occurs high up above Larche with *Erebia stygne* and *E. scipio*. In Eure, it occurs in a large field on the hills of Deux-Amants (Dupont), and in Brittany, Oberthür says that it is widely distributed in the "landes," in the pastures, in wood-ridings, and is sometimes abundant on the sea-shore, *e.g.*, at the Pointe du Raz, whilst, at the other extremity of France, in Var, it is common on the marshes at Hyères, in the Gapeau Valley, and by the edge of the marshes at Ceinturon, where a second-brood flies towards the end of August with swarms of *Raywardia telicanus* and *Polyommatus icarus*, whilst, in the Alpes-Maritimes, it frequents the warm valleys at various elevations, being abundant at least up to 1800 mètres, at which height it is plentiful in the meadows above Colmars, and Beauvézer. In the Pyrenees it is exceedingly abundant, occurring up to an elevation of 6000ft., in June, but appearing to be limited to no especial kind of habitat ; Chapman notes it as reaching an elevation of at least 2000ft. in almost every direction above Gavarnie. In Corsica, Powell says, the species occurs on rough pasture-land with short grass, dwarf juniper-bushes, low-growing thistles with large flowers, etc. ; this species is found, strangely, in the Island, at only a few mètres below the summits of the higher cols, diminishing in numbers down to the level of the forest-trees, and disappearing almost altogether below this, the allied *Plebeius argyrognomon* taking its place as one descends. In Spain, this species excels in size and beauty. It was noticed by Rambur as being common in the mountains about Granada, and has since been taken in abundance in widely different localities, and almost everywhere as highly specialised local forms. In the west, at Bejar, it haunts a flat grassy, heathy stretch of ground, moist in places, and probably distinctly boggy in the wet season ; in the north-west, it occurs commonly in Galicia, at Vigo right down to sea-level, at Casayo on an open hillside facing north-west, with steep and rocky slopes, covered with heath, *Cistus*, *Cytisus*, often with patches of scrub-oak, and in one or two places moister wooded slopes, and, at Brañuelas, on high flat heath and open bog ; in the Albarracin district, it is found in the country about Tragacete and Cuenca, which is very hilly and varied, whilst at La Granja, well between Albarracin and Bejar, the species is more or less abundant all over the rough ground which stretches nearly flat at the foot of the mountains for two or three miles towards Segovia; it appeared to occur in every opening in the woods, by the banks of the streams and up the mountains to at least 1500ft. above the town. Wheeler observes that, in Switzerland, the species is generally distributed in woods and clearings, on roadsides and river-banks, on alpine slopes and pastures up to the tree-limit, sometimes in great profusion. We have ourselves seen it in this country in a variety of situations, among others on the lovely flower-covered slopes between Airolo and Piotta, with swarms of *Aricia astrarche*, *Polyommatus icarus*, *P. hylas*, *Cyaniris semiargus*, *Agriades coridon*, *Heodes virgaureae*, *Melanargia galatea*, and other species, on the glorious slopes near Brugnasco, on the way to Piora; on the outskirts of the woods in the Laquinthal, where the common Erebias abounded to such an extent that there was hardly room for the smaller species, and again on the banks of the Krummbach, at the back of the Simplon village, where it sported with *Plebeius argyrognomon;* indeed, it seems difficult to name an alpine locality where these two species do not occur near together. It is abundant also here and there on the flowery slopes between Haudères and Arolla, and, at the latter place, on the margin of the highest pine-wood in the valley, in full view of Mont Collon, one of the most glorious vignettes in the whole of the Swiss Alps. In the Lower Engadine it is abundant in the flower-clad openings of the pine-wood that crosses the upper slopes between Lavin and Guarda, where it lives with swarms of *Hirsutina damon*, *Agriades coridon*, *Melitaea athalia*, *Erebia aethiops*, and dozens of other interesting species, nor is it uncommon on the rough flower-covered slopes, at a distance from the woods. These slopes are partly clothed with larch, birch, barberry, elder, willow, buckthorn, and other shrubs, sometimes forming dense thickets, at others sparsely sprinkled over the open ground, whilst the chief of the low plants appeared to be a species of *Gnaphalium*, *Epilobium*, umbellifers, golden-rod, *Centaurea*, *Hieracium*, foxgloves, clover, trefoils, scabious, *Echium*, geranium, white galium, various campanulas, labiates, thistles, nettles, etc. In the Göschenen-Thal it prefers an exposed stretch of heath, covered with ling, that lies to the right-hand side of the path, as one goes up the valley. Rowland-Brown notes it as occurring in swarms on the slopes around the chapel of St. Laurent, between Vissoye and Zinal, especially on both sides of the brawling Navigenze, with *Aricia eumedon*, *Polyommatus eros*, *P. hylas*, *Cyaniris semiargus*, etc. Rehfous states that, in the Geneva district and in Cote d'Or, the species loves to congregate at pools of water, or on the sand by the sides of rivers, often collecting in large numbers with *Polyommatus icarus*, *Pieris rapae*, etc., but that it is also found equally abundantly in arid places parched by the sun; in the mountains it collects at the sides of the torrents, in damp spots, with *Cupido minimus*. The localities in which we have found the insect in Italy have much resembled those in Switzerland, always at a high elevation, due to the late season (August) when our observations have been made. We have seen it on the stony slopes largely covered with sparse herbage and dwarf flowers, above Courmayeur, especially where the main Val d'Aosta turns round into the Val Véni, just before reaching the foot of the Glacier de Brenva; it is equally common at the entrance to the Val Ferrex, and is found down the main valley on the steep banks of the Dora just above Pré St. Didier. We have seen it on the heathy slopes between Val Tournanche and Breuil, and also on the flat, in the far distant Vaudois mountains, just before the final ascent to Au Pra in the Pellice Valley. Stefanelli states that it abounds in the Tuscan Apennines in meadows near or close to woods, whilst Cecconi notes it as common in fields and uncultivated places in the second part of August at Vallombrosa. In Bucovina, in the first half of June, 1892, in the rich meadows on either side of a road passing through a wood, on the north side of the Cecina Mt. near Czernowitz, at an altitude of about 400 m., this species was in the greatest abundance, together with *Celastrina argiolus*, *Polyommatus icarus*, *Everes argiades*, *Cyaniris semiargus*, *Agriades bellargus*, *Nomiades cyllarus*, and *Lycaena alcon* (Hormuzaki). In Bulgaria, it was observed in 1899, in all the lower parts of the Bulgarian mountains, up to 5000ft. (Elwes), whilst, in some moist fields in the valley of the Ister, on the south-eastern slopes of the Vitoch, this species occurred with *Everes argiades*, *Polyommatus icarus*, *Agriades bellargus*, *Cyaniris semiargus*, *Aricia astrarche*, *Callophrys rubi*, *Loweia dorilis*, *Heodes thersamon*, *Rumicia phlaeas*, etc. It also occurred on the open ridges in the woods that clothe the southern slopes of Mus Alla near Samakov (Nicholl). Its Russian localities are little known; Assmuss says that it occurs in the Governments of Moscow, Kaluja, and Tambov, in meadows, gardens, clearings in woods, but especially on the outskirts of woods. It Scandinavia, little concerning its habitats seems to be recorded—it occurs on heaths (Linné), the rocky heights behind the town of Christiansand (Morton), along the railway-banks between Disenaen and Saeterstoen (Standen), etc.

British localities.—Locally distributed throughout England and Wales, exceedingly rare or overlooked in Scotland and Ireland.—Anglesea: near Holyhead, Llanfwrog (Freer). Argyleshire: Islay—Port Ellen (W. Braunston-Jones). Berks: Mortimer, common (Cruttwell), Wokingham (Horton), near Newbury (Hopson), between Reading and Burgfield (Rowland-Brown). Berwick (Johnston, *Loudon's Mag.*, vi., 1832). Cambridge: local (Bond)—Cambridge (Waters), Gamlingay (Dale). Carmarthen: near Laugharne (Holmes), Llandovery (Andrews). Carnarvon: Abersoch (Arkle). Cheshire: Delamere Forest, Abbotts Moss (Arkle), Whitegate Heath, local (Collins), Oakmere, common (Day), Bidston Hill, formerly (Prince), Noctorum Heath near Birkenhead (Sharp). Cornwall: western half—Breage, Sithney, Perranporth, Looe, Whitsand Bay (V.C.H.); Lizard district, very common (Marshall), Carbis Bay (James), Land's End (J. E. Gardner), Newquay district, Truro (Rollason), Falmouth (Reading's List). Cumberland: Keswick district, rare (Beadle). Devon: Sidmouth (Majendie), Mortehoe district, Woolacombe (Longstaff), Teignmouth district abundant, Little Haldon (Rogers), Torquay district (Walker), Bolt Head (Sheldon), Gaddon Down near Cullompton (Angus), Woodbury near Exeter, common (Pope), Salcombe, Exmouth, Milber Down, Newton Abbott (Prideaux), Bovey-Tracey, Axminster, rare (Reading's List), Paignton district (Sweeting). Dorset: Parley Heath, common, Blandford racecourse (Dale), Colhill near Wimborne (Stephens), Portland (Sheldon), Dorchester, Weymouth (Bingham), Canford Heath near Parkstone (Bromilow), Dunyeats Hill near Poole (Curtis), Isle of Purbeck, Isle of Portland (Bankes), Cranborne (Nelson), Swanage (Alderson), Blandford (Stainton), Bloxworth (Cambridge). Durham: South Durham (Harrison), Darlington, very common (Lang). Essex: apparently confined to Epping Forest (V. C. H.), Loughton (Burrows), Epping district, locally common (Harwood), near High Beech (Argent). Glamorgan: Llantrissant, scarce (John). Gloucester: local—Clifton, rare (Hudd), Durdham Down, Stapletown, scarce (Harding), Bristol (Stainton). Hants: Isle of Wight—Hampstead near Yarmouth (Bond), Newport (Owen), Parkhurst Forest (Pool), New Forest—Lyndhurst (Alderson), Bank (Carr), Bournemouth (Raynor), Norley Wood (Guise), Ringwood (Crotch), Brockenhurst (Frohawk), Matley, Lymington, near Hordle, and the outside of Ramnor Enclosure (Hawes), Portsdown Hill, Shedfield (Pearce), Farnborough (Rothschild), Petersfield (Robinson), Warsash, Southampton (Swinton), Winchester district, Silkstead Heath, Crabbe Wood Lane (Hewett), Horndean district (Hawker), Fleet (S. G. C. Russell), Emsworth (Buckler), Woolmer Forest (Barrett), near Southsea Common (Davies), Woodhay Common, near Newbury, Hodwell Cliff (Stephens), Sheep Wash near Petersfield (Moncreaff). Hereford: Hereford (Hutchinson), the Black Mountains (Newman). Hunts: St. Ives (Norris), Monk's Wood, and other woods (Bond). Kent: on all the chalk-downs—Cuxton, Halling, etc. (Tutt), Darenth and Birch Woods (Machin), Holly Hill (Walker), St. Margaret's Bay (Fenn), Eynsford (Shaw), Canterbury district (Parry), Dartford, Knockholt, Ashford (Wood), near Lower Fant (Golding), Crown Wood, Shooter's Hill, formerly (West), Coombe Woods (Stephens), Shorncliffe (Rogers), Chatham district (Chaney), Westwell (Gardner), Shoreham (Bower), near Walmer, Kingsdown (Cardew), Maidstone district (Goodwin), Tunbridge Wells Common (Raynor), near Frant Forest, swarms (Ramsay-Cox), Sevenoaks district (Holmes), Pembury (Cox). Lancashire: very local, but usually common where it occurs (Ellis)—Underbarrow Moss (Moss), near Lancaster (*teste* Hodgkinson), Manchester (Stainton), Holker Moss (Murray), Chat Moss, Barton Moss (J. Chappell), Solwich Moss, near Preston, formerly (Hodgkinson). Lincoln: North Lincoln, common (Simmons), Blyton Carr, very common (Fyles), Epworth (Hudson), Laughton, common, Gainsborough (Burton), Owston Ferry district (Reynolds), Hartsholme, Doddington (Musham), Holbeach district, scarce (Curtis). Merioneth: Tan-y-Bwlch (Kerr), Barmouth (Kenward). Middlesex: Scratch Wood, near Edgware (Bond), Harrow district (Melvill), Ruislip, plentiful (Woodbridge). Monmouth: Pontnewydd (Conway, *Loudon's Mag.*, vi., 1832), Castle y Bwch (Loch). Norfolk: locally abundant—Stratton Strawless (Barrett), Brandon (Bower), Drayton Drury, Cawston, Beiston (Norgate), Attlebridge (Barraud), King's Lynn (Atmore), Holt (Haworth). Northampton: Barnwell Wold (Bond), near Towcester (Clark). Nottingham: West Bridgford, common (Simmons), near Nottingham (Smith), Clumber Park near Mansfield (Goss). Pembroke: Pembroke (Puckridge), Tenby (Robertson), Castlemartin (Hodge). Perth: Perth (White, *E.W.I.*, vii., p. 147), near the Pass of Killiecrankie (Morison, *E.W.I.*, vii., p. 169). Renfrew: near Gourock, one ♂ (Mackieson). Somerset: very local and uncommon in the county, except near Bridgwater, where it has been taken freely—Bath, Clevedon, Sidcot (Corder), Taunton (Bidgood), Brockley, etc. (Hudd). Stafford: Wolverhampton, rare (Morris). Suffolk: locally common—Brandon, Foxhall, Lound (Bloomfield), Herringfleet Heath (Crowfoot), Sudbury (King), Bixley Decoy, Nacton (Jermyn), Tuddenham (Norgate), Ipswich (Last). Surrey: Hindhead, Milford, Abrook Common, Whitemoor Common, Worplesdon, Byfleet, Chobham (Barrett), Oxshott (Bird), Bagshot (Floersheim), Chertsey, Woking (Raynor), Haslemere, Dorking (Oldaker), Headley Lane, Box Hill (Trimen), Witley, Guildford (Champion), Frimley (T. Bainbrigge-Fletcher), Camberley (Watson), Reigate district, local (Tonge), Ripley, Basingstoke Canal (Turner), between Claygate and Esher (Carr), Wisley Ponds (Lucas). Sussex: local—Brighton, Hayward's Heath (Jenner), Polegate and Hailsham district, common (Hamlin), near Storrington (Bird), Ashdown Forest (Hodgson), Burgess Hill (Dollman), Abbott's Wood (Salvage), St. Leonard's Forest (Mansbridge), East Grinstead, abundant, Chailey, Lewes (Wightman), Crowborough Common, abundant (Peskett), Cliffe Hill (Weir), Tilgate Forest (B. W. Adkin), Goodwood Park, Hurston Warren, Upmardin (Fletcher), Rogate Common (Buckler). Warwick: Coleshill Park, Sutton Park (Enock), Rugby district, very rare (Longstaff). Westmorland: Witherslack, Kendal district (Moss), Faraway Moss, Whitbarrow Scar, locally abundant (Hodgkinson), Brigsteer Moss (Holmes). Wicklow: The Murrough of Wicklow, near Rostrevor (Birchall). Wilts: Old Sarum (Manders). Worcester: Trench Woods (Rea). Yorks: scarce, has apparently disappeared from some of its old recorded localities—Scarborough (Wilkinson), Selby (Hebson and Foster), near York (Prest), Sheffield (Doncaster).

Distribution.—From Ireland in the west to Japan in the east, and from the Mediterranean littoral, Persia, and north China in the south, to Scandinavia, 62°-63° N. lat., in the north.—Asia: Asia-Minor—Amasia, on top of the Lokman (Fountaine), Broussa, common (Mann), Taurus mts. (Bethune-Baker), Armenia (*teste* Rühl), Jenikeui tableland (Staudinger); Syria—Afka (Nicholl); Persia—north Persia (Funke), near Schahkuh, Schahrud, Pasnaur, nr. the lighthouse of Apscheron (*teste* Rühl), Hyrcania (Hüne); Altai Mountains—southeast Altai, Bashkaus, 3000ft.-6000ft., Ongodai (Jacobson); Turkestan—Samarkand (Godman-Salvin coll.); Pamir—Darvaz, Valley of Khingoob, Su-tcheou Kansu (Grum-

Grshimailo); Thian-Shan and Kouldjà district (Alphéraky); Tarbagatai and Ala Tau, Lepsa (Haberhauer); Margelan (*teste* Bethune-Baker); Russian Tartary—Vladimir Bay (Lang coll.); Kirghis-Steppe (Grum-Grshimailo); Trans-Baikal district—Lake Baikal (*teste* Rühl); Kentei district—Pokrofka, Sutschan (Dorries); Amurland—Vladivostock (Graeser), Raddefka, Baranowka, Ussuri, Chabarowka, Askold Island (Staudinger); Corea—Gensan, common (Leech), Lena district (Herz); Japan—central Japan—Kisagawa, Asahigawa (Elwes), mountain districts, Yesso (Leech), Iburi, Hokkaido (Fenton), Oiwake (Leech), Nikko, 4000ft.-5000ft. (Elwes); China—north China (Oberthür). EUROPE.—AUSTRO-HUNGARY: Austria, common throughout (Höfner): Bohemia—Karlsbad district—Ewiges Leben, Satteles, Elbogen (Hüttner), Senftenberg (Fritsch); Moravia—Brünn (Schneider), Kremsier, Neutitschein (Fritsch); Upper Austria—Linz, Steyer, Wels, not rare (Brittinger); Lower Austria—almost everywhere common—Hernstein district (Rogenhofer), Vienna (Fritsch); Salzburg up to 4000ft.—near Salzburg (Nickerl), Gastein (Hormuzaki), the Leopoldkron Moss, the Söllheim Moss, Guggenthal, the Aigner Valley, on the Rosenhügel, the Fuscher Valley, Heiligenblut, up to 4000ft. (Richter); Tyrol to 4300ft.—Bozen, Campiglio, Mendel (Tutt), Trafoi (Frey), Trient, the Möllthal (Mann), Brenner district, Navis-Thal (Galvagni), Innsbruck (Lemann), Villach, the Vintschgau, Wormserjoch (Hinterwaldner), Schluderbach (Mann), the Taufers Valley (Weiler), Muttekopf, Taufer Alps, Seiser Alp, M. Baldo, M. Lobbia, Franzenshöhe (Heller); Carinthia—very common (Höfner), Kor Alpe (Chapman), Wolfsberg, Flitsch, Preth, Raibl (Zeller), Kotschachthal (Hormuzaki); Carniola (Mann); Dalmatia (Mann); Croatia—Josefsthal (Mann), Agram (Grund), the Dobrudscha (Mann); Istria—Trieste, Pola (de la Garde), Divaca, St. Canzian (Romieux); Styria—Ennstal—foothills of the Scheiblingstein, Krumau (Ströbl), Gesäuse (Kiefner); Slavonia—Lipik (Rühl); Hungary—Budapest (Lemann); Cserna, Budafok to Kelenfold (Jones); Sopron Comitat—Csorna, Verzprem C.—Also Ors, Almadi, Hajdu C.—Nadudvar, Bihar C.—Czehtelek, Bishopsbad (Rothschild), Hermannstadt, Debreczin, Mehadia (*teste* Rühl), Herculesbad (Fountaine). Bucovina—Cecina mountains, near Czernowitz (Hormuzaki). BELGIUM: distributed but local—Dinant (Derenne), Beez, Marche-les-Dames (Lambillion). BOSNIA AND HERCEGOVINA: distributed and common, rarer in the Karstgebiete, reaching 1300m. above sea-level—Dervent, Bosnatal (Hilf), Trovrh, Zenica, Visegrad (Sturany), Jaicé (Rebel), Klekovaca, Bjelasnica (Apfelbeck), Kalinovik (Schreitter), Cvrstnica, Maklenpass, Jablonica (Hilf), the Prenj—from Glogovo 1050m. to Podasje 1300m., very common (Penther), Nevesinje, common (Uhl), Velez, Grab, Volujak (Apfelbeck), Gacko (Rebel), Jessero (Elwes), Mostar (Fountaine). BULGARIA AND EAST ROUMELIA: everywhere distributed and very common—near Sofia, the Ister Valley, on the slopes of the Vitoch, Rilo to 1300m., Mus Alla, near Samakow (Nicholl), Rasgrad, Rustschuk, Stara Zagora, Slivno, Varna (Rebel), Camkurya, in the Rilo Dagh, 4000ft. (Elwes). CHANNEL ISLANDS: Jersey, common, Guernsey, common on southern coast, Sark, everywhere abundant, Jethou, Herm (Luff). CORSICA: rarely below 3000ft.—Col de Scaiella, altitude 1173m., between Bastelica and Bocognano, the Vizzavona Pass (Powell), Tattone (Lemann), La Foce (Yerbury), Evisa, La Piana, Col de Vergio (Fountaine), Bastia (Lang), Ajaccio (Rowland-Brown). DENMARK: throughout (Bang-Haas). FINLAND: common throughout, except Lappmark—northernmost locality, Kunsamo, 65°N. lat. (Federley). FRANCE: throughout, but localised—Ain—Divonne (Reverdin), la Faucille (Rehfous); Aisne—St. Quentin, generally (Dubus); Allier—Moulins (Peyerimhoff); Alpes-Maritimes—Daluis, Levens, Puget-Theniers, Roubion, St. Martin Vésubie (Powell), Vallon Obscur, Nice (Lang), Cannes (Oberthür); Ariège—Ax-les-Thermes (Rowland-Brown); Aube—les Riceys, etc., common in July and August (Jourdheuille); Aude—common (Mabille), Carcanières (J. E. Jones); Basses-Alpes—throughout, Beauvézer, Colmars, Entrevaux (Powell), Annot (Lang), very common at Digne (Rowland-Brown); Basses-Pyrénées—generally (Rondou), Guéthary, near Biarritz (Sheldon), Lac de Mouriscot (Keynes); Brittany, throughout (Griffith); Bouches-du-Rhône—banks of the Arc at Berre (Frionnet), common in the environs of Marseilles, Aix-en-Provence, St. Pons (Siépi), Vallon-de-Toulouse, Ste. Baume (Powell); Calvados—Leaupartie, Bavent, Troarn (Moutiers), Maltout, Mouen, Merville, Cabourg, etc. (Fauvel); Charente-Inférieure—Royan (Salis); Cher—common, St. Florent, Sologne (Sand); Corrèze—Meymac, abundant (Dupont); Côtes du Nord—Val André (Turner); Côte d'Or—near Dijon, Nuits, Beaune, St. Jean de Losne, Pagny, Glanon, Seurre (Rehfous); Creuse (Frionnet); Dordogne—Bergerac, etc. (Tarel); Doubs—Besançon (Bruand); Eure—rare, and very local, Pont de l'Arche, hills of Deux-Amants (Dupont); Eure-et-Loir—very common (Guenée); Finistèrre—Forest of Quimperlé (Oberthür); Gard—Uzès (Blachier), Pont-du-Gard (Lang); Gironde—environs of Bordeaux, common (Robert Brown), Pessac, Merignac (Trimoulet); Haute-Garonne—Toulouse, Madron, St. Gaudens, Luchon, Lac d'Oo, Val de Lys (Caradja); Haute-Marne—Langres, Hortes, Latrécey, St. Dizier (Frionnet); Haute-Saône—Valley of the Ognon, Luxeuil-les-Bains (Gibbs); Haute-Savoie—Megève to St. Gervais (Tutt), Chamonix (Rowland-Brown), Mt. Salève (Rehfous), Grammont (Muschamp); Haute-Vienne—Limoges (Samy); Hautes-Alpes—Larche (Tutt), Le Lautaret (Godman), Les Fréaux, near La Grave (Tutt); Hautes-Pyrenees—generally (Rondou), St. Sauveur, Gèdre, Héas (Bath), Gavarnie (Rowland-Brown); Hérault—Montpellier (Millière); Ille-et-Vilaine—Rennes, Monterfil (Oberthür); Indre—Nohant, common (Sand), Fontgombault, local, in the hills above the Creuse-Blanche (Martin); Isère—Uriage (Reverdin), St. Laurent-du-Pont, common (Forbes), Bourg d'Oisans (Godman), Clelles (Tutt); Jura—Baume-les-Messieurs (Benthal); Loir-et-Cher—forest of Russey, environs of Chailles, rare (Chevillon); Loire-Inférieure — Portnichet (Deherman-Roy); Lozère—Florac, Mende, Château-de-la-Caze, etc. (Rowland-Brown); Maine-et-Loire—common, and sometimes with blue females (Delahaye); Manche—Cherbourg (Nichollet); Marne—Rheims, Epernay, very common (Demaison); Meurthe-et-Moselle — meadows of Tomblaine, Nancy (Cantener); Nord—rather common at St. Malo-les-Bains, Rosendael, etc. (Paux), dunes of Dunquerque and Calais (le Roi); Oise (Pinard); Puy-du-Dôme — Puy-de-Gaudy, etc. (Sand); Pyrénées-Orientales — very common up to 6000 ft., Collioure (Elwes), le Vernet (Fountaine), Sorède (Spröngerts); Saône-et-Loire—common (André and Constant); Savoie—St. Michel de Maurienne, Lanslebourg, Bourg St. Maurice (Tutt), Grésy-sur-Aix (Cochrane), Salins, Brides-les-Bains (Reverdin): Seine — environs of Paris (Goossens); Seine-et-Marne—Fontainebleau (Tutt), Nemours (H. Brown); Seine-et-Oise—Beauchamp (Dupont), Lardy, Sannais, Corneilles (H. Brown); Seine-Inférieure—near Eugleville and Arques (Moore), Sahurs-sur-Seine (Viret), Orival (Martel), rare, Côte-de-Ste.-Catharine, Rouen, St. Adrien, Canteleu, Boisguillaume (Noel); Somme (Frionnet); Var—Gapeau Valley, Ceinturon, la Plage, Hyères (Powell), Lavandou, Carqueiranne, Giens (Blachier); Vaucluse—Brantes (in coll. H. Brown); Vosges—St. Maurice-sur-Moselle, le Tholy, Charmes, abundant (Gibbs); Yonne — Charbuy, Appoigny, rare (Mabille). Germany: almost everywhere, from sea-level to the tree-limit (Speyer); East and West Prussia, throughout — Königsberg, Rastenburg, Willenberg (Schmidt); Tilsit, Cranz, Rauschen, Neuhäuser, Caporn Heath, Dammhof, Gross-Raum, Metgethen, Juditten, Tapiau, Wehlau, Brandenburg, Braunsberg, Osterode, Diwitten, Ganglau, Angerburg, Lyck, Damerau, Graudenz, Rosenberg district, Danzig, Hela, Zoppot, Karthaus, Alt-Kischau, Jastrow (Speiser); Pomerania—frequent throughout on heaths—Damm, on the road to Massow, Nemitz, on the road to Falkenwalde, Warsow, Carolinenhorst. etc. (Hering); Demmin, Helmshagen (Paul and Plötz), Kratzberg, Moysall, Barhöft, the Darss, near Drigge, Altefähr, the Dänholm, Hiddensee (Spormann); Mecklenburg—Neustrelitz (Gentzen and Messing), near Rülow (Sponholz), Friedland, throughout, behind the Stausee (Stange), near Tarzow, between Schwerin and Ludwigslust, forest of Mestlin (Schmidt), Schwerin (Vöelschow), the Buchholz (Schröder), the Schelfwerder, singly, Parchim (Gillmer), Lübeck district, Wesloe Moss, Paling Heath (Tessmann); Lauenburg, Hamburg, Schleswig-Holstein—Eutin, frequent (Dahl), Hamburg (Tessien); North Sea Islands—Isle of Sylt (Werneburg), Heligoland (Dalla Torre); Hanover—Hildesheim district (Grote), Lüneburg, frequent (Machleidt and Steinvorth), Bremen (Rehberg), Hanover (Glitz), Mecklenheide, Misburg, Isernhagen, Burgwedel (Peets), Osnabrück (Jammerath), Hameln (Jordan); Westphalia—Höxter (Jordan); Rhine Provinces—Galenberg, Zwergslöcher (Grote), Bonn, Boppard, Bingen, not rare, Aachen and Cologne, rare, Barmen, not rare (Stollwerck), Kreuznach (Elwes), Solingen, Haan, Hilden and Schlebusch Heaths, very common (Weymer), Neuenahr (Maassen), Krefeld district, Hülserbruch, Sankert, Hülserberg, Forstwald, Willich-Heath (Rothke); Hesse—Frankfort-on-Main, the Stadtwald, Niedgau, the Taunus, Wiesbaden, the Bergstrasse, the Wetterau, the Hinterland (Koch), Grünberg (Glaser), Wied-Selters district (Schenck), Darmstadt, Worms, very frequent, local and rarer in Upper Hesse (Glaser), Mombach, frequent (Rössler), Oberursel, not frequent (Fuchs), Hanau, everywhere (Limpert and Röttelberg), Cassel, near Guntershausen (Borgmann), Rotenburg, rare (Jordan); Waldeck—very abundant (Speyer); Thuringia—everywhere common—Arnsberg (Henze), Gotha (Knapp), Gera (*Ent. Ver. Gera*), Zeitz, near Ossig, Lonzig (Wilde), Rudolstadt (Jordan); Province of Saxony—Erfurt (Keferstein and Werneburg), Halle, Dölau Heath, near Nietleben (Stange), Mühlhausen, rare, Naumburg, Nordhausen, Kyffhäuser (Jordan); Anhalt—frequent—Oranienbaum Heath (Kunze), near Dessau (Rühl), Mosigkau Heath (Amelang), the Wörnitz, frequent, the Brachmeierei, singly, the Hirtenhau, rare (Gillmer); Harz and Brunswick—Brunswick, very common, Helmstedt (Heinemann), Wernigerode (Fischer), northeast border of the Harz, rare, Steinholz, Friedenstal (Reinecke), Quedlinburg, Osterode, near Göttingen, frequent (Jordan); Brandenburg—Berlin district, Jungfernheide, Spandau, Potsdam, Johannisthal, Lichtenrade, Bernau, etc. (Bartel and Herz), Grünewald (Schultz), Rüdersdorf (Dadd), Neu-Ruppin (Nürnberg), Frankfort-on-Oder, near Kornbusch (Kretschmer), Schäfereiberg (Herrmann); Posen—common (Schultz); Silesia—the Trebnitz mountains (Döring), Upper Lusatia, very common (Möschler), Sprottau district (Pfitzner), Görlitz Heath, the Mühlbock road, the Scheibteichlinie (Marschner), Brieg (*teste* Rühl); Kingdom of Saxony—distributed, Freiburg (Fritzsche), Dresden (Rühl), Saxonian Upper Lusatia (Schütze), Leipzig district, Lausigk, Leisnig, Nossen (Zellwald), Chemnitz district, Crimmitschau, Werdau, Zwickau, Annaberg, Schneeberg (*Ent. Ver. Iris*), the Elster Bad, on the Brunnenberg, near Asch (Winkler); Bavaria—Regensburg (Herrich-Schäffer), Munich (Kranz), Oberstdorf, Oythal (Dadd), Kissingen (Rühl), Augsburg, on the Lechfeld (Freyer), Kempten (Kolb); Württemberg—Tübingen, not rare, Reutlingen, Stuttgart (Seyffer); Baden—distributed, on the Isteiner Klotz (Reutti), Maxau (Gauckler), Lahr (Keynes); Alsace—Hüningen (Leonhardt); Rhine Palatinate (Linz and Bertram). GREECE: Parnassus (Staudinger), Islands of Corfu, Syra, Tenos (*teste* Rühl). ITALY: Piedmont—Val Tournanche, Courmayeur, Val Ferrex, Val Véni, Pré St. Didier, between Bobbie and the Pellice Falls, above Au Pra (Tutt), Val Bregaglia (Elwes), Oulx (Godman), Macugnaga (Chapman), Certosa di Pesio (Norris), Chiesa, Bormio, Susa (Rowland-Brown), Sacro Monte, Orta Novarese (Lowe), Como, Olgiate-Molgora, Esino (Fountaine); Roma—Roman Campagna (Zeller), Rome (F. B. White); Liguria (Curò); Tuscany—Pistoiese Apennines, very common (Verity), Vallombrosa (Cecconi), Florence, Le Prese (F. B. White), Boscolungo (Stefanelli), near Leghorn (Mann), Limone, Tombolo (Schiavazzi), Lucca (Walker); Venetia—Venetian Alps—Lago de Cavazzo (Senna); Lombardy—hill districts (Turati). LUXEMBOURG: Kopstal, Sandweiler, Niederanwen, Gravennaches (Dutreux). NETHERLANDS: Drenthe, Overyssel, Utrecht, Gelderland, North Brabant, Limburg, South Holland, Katwijk (Snellen), Arnhem, Breda (Heylaerts). PORTUGAL: Coimbra, São Antonio, Cea, near Ponte de Marcellos (Eaton), Serra da Estrella—Our Lady of Orada, near Lake Paxao (Tavares), Nave de Santo Antonio (Santos), Minho dist.—Guimarães, Felgueiras (Moraes). ROUMANIA: Tulcea (*teste* Rühl). RUSSIA: Baltic Provinces—Riga district (Teich), Bilderlingshof (Druce); Governments Moscow, Kaluja and Tambov (Assmuss); Bessarabia—Ourjom (Kroulikowsky); Wiatka Government, everywhere (Kroulikowsky), Gorki, Novorossiisk (*teste* Rühl); Governments Simbirsk, Orenburg (Eversmann); Caspian district—Emba river (Grum-Grshimailo); Caucasus—Achaleicht (Elwes coll.); Transcaucasia, throughout, Kasikoparan (Romanoff), St. Petersburg, Seratchowo, Karugui, Lachta (Grum-Grshimailo), Narum (Bethune-Baker). SCANDINAVIA: in the south and centre, rare in the north: Sweden—up to between 60° and 63° N. lat. (Aurivillius), Skania to Helsingland (Lampa), near Stockholm (*teste* Rühl); Norway—throughout, as far north as Bossekop, Bergen, rare, in the mountains on the Storfjeld, Gudbrandsdal, Sarpsborg (Siebke), Smaalene, Akershus, Hedenmarken, Christiania, Buskerud, Bratsberg, Jarlsberg, Laurvik, Nedenaes, Lister, Mandal, Stavanger, Romsdal (Schöyen), Saeterstoen (Chapman), Hunneberg (Lampa), Löholt, Sande, Romsdal (Jordan), Sireosen, Siredal, Tou, Ose (Strand), Ostersund, Fjösanger, near Bergen (Rowland-Brown), eastern coast of Christiania Fjord (Standen), Christiansand (Morton), Bolkesjo, 1700ft. altitude, between Disenaen and Saeterstoen (Standen). SERVIA: Ak Planka (Rebel). SPAIN: Asturias—Picos de Europa, 5000ft. (Nicholl), near Bilbao (Seebold); Galicia—Vigo, Casayo, Brañuelas (Chapman); Leon—Bejar (Chapman); Old Castile—La Granja (Lowe), Canales (Chapman), Madrid (Oberthür); New Castile—Cuenca, Tragacete (Chapman); Aragon—Teruel (Fountaine), Albarracin, Moncayo (Chapman); Catalonia—Montserrat (Jones); Andalusia—Sierra Nevada mountains (Rambur); Granada—Huejar (Nicholson), Granada, Alfakar, Lanjaron, towards the Picacho de Veleta (Oberthür). SWITZERLAND: Geneva district—Florissant, Sierne, Veyrier, Cologny, Hermance, Versoix, Satigny (Rehfous), Vengeron, Bois des Frères, Bois Taille, Allondou (Reverdin); Basle; Aargau—Baden (Rühl); Berne—Wengen district, Kleine Scheidegg (Moss), Engelberg (Bethune-Baker), Meiringen (Lang); Grisons—Val Bregaglia, Val Fex (Elwes), Bergün, Tuors Pensch (Zeller), Lavin, Guarda, Sus (Tutt), Pontresina (Chapman), Filisur (Rühl), Thusis

(Rowland-Brown); St. Gall — Weesen Marsh (Lowe); Ticino — Airolo, Fusio (Blachier), Brugnasco, Piotta (Tutt), San Martino (Knecht), Locarno (Chapman); Uri — Trübsee-Alp (Keynes), Göschenen-Thal (Tutt); Valais — Dent du Midi (Muschamp), Orsières (Bethune-Baker), Simplon, Laquinthal, Useigne, Evolène, Haudères to Arolla, above Arolla (Tutt), Visp-Thal, Saas-Thal (Jordan), Randa, Zermatt, Tasch-Alp, Schallberg, Bérisal, Steinenalp, Alpienalp, Gondo (Reverdin), Bellalp (Frey), Martigny, Vernayaz (Blachier), the Pfynwald (Pearson), Niouc, above Sion (Favre), le Bouveret, Ganter-Thal, Steinenthal (Wheeler), Riffel-Alp (Lemann), Zmutt-Thal (Bath), near Sion (Tetley), Val d'Hérens (Tasker), Binnenthal, Zinal, above Branson (Sheldon), Champèry (Page); Vaud—Bex (Murray), Les Avants (Rowland-Brown), St. Georges, Veytaux and the Veraye Gorge (Wheeler), Aigle, Sépey, Villars (Moss); Rossinières (Tasker); Zürich—near Zürich (Rühl).

Genus: Cyaniris, Dalman.

Synonymy.—Genus: **Cyaniris,** Dalm., “Vet. Ak. Handl.,” pp. 63, 94 (1816); Billb., “Enum. Ins.,” p. 80 (1820); Vill. and Guen., “Tab. Syn. Lep. Eur.,” i., p. 19 (1835); Tutt, “Ent. Rec.,” xviii., pp. 131-2 (1906); “Nat. Hist. Brit. Lep.,” viii., p. 313 (1906); ix., p. 379 (1907); “Ent. Rec.,” xxi., p. 108 (1909). **[Papilio-Plebeius-] Ruralis,** Rott., “Naturf.,” vi., p. 20 (1775); Fab., “Sys. Ent.,” p. 525 (1775); Esp., “Schmett. Eur.,” pl. xxi., figs. 1*a*, *b* (1777); i., p. 277 (1779); Bergstr., “Nomen.,” ii., p. 79; iii., pp. 8, 14, 19 (1779); Göze, “Ent. Beitr.,” iii., pt. 2, p. 26 note, p. 55 (1780); Fab., “Spec. Ins.,” ii., p. 123 (1781); “Mant. Ins.,” ii., p. 73 (1787); Rossi, “Fn. Etrus.,” ii., p. 156 (1790); Haw., “Lep. Brit.,” p. 48 (1803); Ill., “Rossi's Fn. Etrus.,” ii., pp. 247-8 (1807). **Papilio,** Schiff., “Schmett. Wien,” p. 182 (1775); Fuess., “Verz.,” p. 31 (1775); Geoff., “Fourc. Ent. Paris.,” ii., p. 245 (1785); Schneid., “Syst. Beschr.,” p. 269 (1787); Bkh., “Sys. Beschr.,” i., pp. 172, 282 (1788); ii., p. 119 (1789); Lang, “Verz.,” 2nd ed., p. 56 (1789); Scriba, “Journ.,” p. 119 (1791); Bkh., “Rhein. Mag.,” i., p. 283 (1793); Lewin, “Ins. Gt. Brit.,” p. 80, pl. xxxviii., figs. 6-7 (1795); Hb., “Eur. Schmett.,” pl. lvi., figs. 267-271 (1796); Ill., “Schmett. Wien,” 2nd ed., p. 264 (1801); Hffmgg., “Ill. Mag.,” iii., p. 186 (1803); Lasp., “Ill. Mag.,” iv., p. 63 (1804); Herbst, “Nat. Syst. Ins.,” xi., p. 177, pl. cccx., figs. 1-3 (1804); Hb., “Eur. Schmett.,” text, p. 45 (1805); Ochs., “Schmett. Sachs.,” p. 306 (1805); “Die Schmett.,” i., pt. 2., p. 14 (1808). **[Hesperia-] Ruralis,** Fab., “Ent. Sys.,” iii., pt. 1, p. 295 (1793). **Cupido,** Schrank, “Fn. Boica,” ii., p. 210 (1801); Kirby, “Syn. Cat.,” p. 372 (1871). **Hesperia,** Panz., “Schäffer's Icones,” 2nd ed., p. 163, pl. clxxxv., figs. 1, 2 (1804). **Polyommatus,** Latr., “Hist. Nat. Crust.,” xiv., p. 120 (1805); Godt., “Enc. Méth.,” ix., p. 703 (1819); “Pap. Fr.,” i., p. 224, pl. xi. *sec.*, fig. 7, pl. xi. *quart.*, fig. 4 (1821); Curt., “Brit. Ent.,” v., fol. 9 (1824); Stephs., “Illus.,” Haust., i., p. 86 (1828); “Ins. Cat.,” 1st ed., ii., p. 23 (1829); Bdv., “Eur. Lep. Ind.,” p. 13 (1829); Meig., “Eur. Schmett.,” ii., p. 6, pl. xlvi., figs. 4*a-c* (1830); Ramb., “Fn. And.,” p. 274 (1839); Wood, “Ind. Ent.,” p. 8, pl. ii., fig. 63 (1839); Westd., “Syn. Gen.,” p. 88 (1840); Humph. and Westd., “Brit. Butts.,” p. 102, pl. xxxi., figs. 9-11 (1841); Stephs., “List,” 1st ed., p. 2 (1850); 2nd ed., p. 17 (1856); Stn., “Man.,” i., p. 58 (1857); Hein., “Schmett. Deutsch.,” i., p. 73 (1859); Kirby, “Man.,” p. 110 (1862); “Eur. Butts.,” p. 46 (1882); Dale, “Hist. Brit. Butts.,” p. 56 (1890); Barrt., “Lep. Brit. Isl.,” i., p. 94, pl. xiv., figs. 2-2*b* (1893). **Lycaena,** Oken, “Lehrb.,” ii., p. 718 (1815); Leach, “Edin. Enc.,” ix., pt. 1, p. 130 (1815); Ochs., “Die Schmett.,” iv., p. 25 (1816); Sam., “Ent. Comp.,” p. 242 (1819); Koll., “Verz. Schmett. Oestr.,” p. 8 (1832); Bdv., “Gen. et Ind. Meth.,” p. 12 (1840); Neüst. and Korn., “Schmett. Schles.,” pt. 1, p. 44, pl. xx., fig. 65 (1842); H.-Sch., “Sys. Bearb.,” i., p. 116 (1843); Evers., “Fn. Volg.-Ural.,” p. 44 (1844); Dup., “Cat. Méth.,” p. 31 (1844); Freyer, “Neü. Beitr.,” v., p. 155, pl. ccccli., fig. 4 (1845); Nick., “Lep. Fn. Böhm.,” p. 18 (1850); Hdnrch., “Lep. Eur. Cat.,” p. 13 (1851); Meyer-Dür, “Schmett. Schweiz,” p. 89 (1851); Westd. and Hew., “Gen. Diurn. Lep.,” ii., p. 492 (1852); Led., “Verh. zool.-bot. Gesell.,” ii., p. 19 (1852); Wllgrn., “Skand. Dagf.,” p. 238 (1853); Gerh., “Mon. Schmett.,” p. 9, pl. xiii., figs. 4*a-c* (1853); Ménét., “Cat. Mus. Pet.,” p. 57 (1855); Koch, “Schmett. Deutsch.,” p. 27 (1856); Ramb., “Cat. Lép. And.,” p. 42 (1858); Speyer, “Geog. Verbr.,” i., p. 247 (1858); Dbldy., “Syn. List,” 2nd ed., p. 2 (1859); Zebr., “Lep. Krak.,” p. 155 (1860): Staud., “Cat.,” 1st ed., p. 6 (1861); Rössl., “Schmett. Nass.,” p. 16 (1866); Snell., “De Vlind.,” i., p. 57 (1867); Berce, “Fn. France,” i., p. 147 (1867); Nolck., “Lep. Fn. Estl.,” i., p. 58 (1868); Newm., “Brit. Butts.,” p. 133, fig. 45 (1871); Staud., “Cat.,” 2nd ed., p. 14 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 104 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 394 (1874); Curò, "Bull. Soc. Ent. Ital.," vi., p. 113 (1874); Sand, "Lép. Ber. Auv.," p. 7 (1879); Frey, "Lep. Schweiz," p. 21 (1880); Peyerim., "Lép. Als.," p. 25 (1880); Rössl., "Lep. Wiesb.," p. 31 (1881); Jourdh., "Lép. Aube," p. 19 (1883); Lang, "Butts. Eur.," p. 129, pl. xxxi., fig. 5 (1884); Lampa, "Ent. Tids.," vi., p, 15 (1885); Kane, "Eur. Butts.," p. 49 (1885); Kill., "Ins. Graüb.," p. 21 (1886); Auriv., "Nord. Fjär.," p. 15 (1888-91); Brom., "Lep. Riv.," p. 43 (1892); Rühl, "Pal. Gr.-Schmett.," i., pp. 296, 767 (1892-5); Favre, "Macr.-Lép. Val.," p. 23 (1899); Staud., "Cat.," 3rd ed., p. 89 (1901); Fleck, "Macr.-Lép. Rumän.," p. 22 (1901); Lamb., "Pap. Belg.," p. 246 (1902). **Zephyrus,** Dalm., "Vet. Ak. Handl., p. 95 (1816). **Nomiades,** Hb., "Verz.," p. 67 (1816-18); Stephs., "Illus. Haust.," iv., app. p. 404 (1834); Scudd., "Hist. Sketch," p. 228 (1875); Tutt, "Brit. Butts.," p. 164, pl. ii., figs. 8, 9 (1896); Kirby, "Hndbk.," etc., ii., p. 106, pl. xlix., figs. 6, 7 (1896); Tutt, "Ent. Rec.," vii., pp. 220, 300 (1896); Grote, "Schmett. Hild.," p. 42 (1897); Reuter, "Ent. Rec.," x., p. 97 (1898); Wheel., "Butts. Switz.," etc., p. 25 (1903); South, "Brit. Butts.," p. 177, pl. cxv., figs. 9-12 (1906). **Argus,** Dup., "Pap. Fr.," supp. i., p. 390 (1832); Cant., "Lép. Var," p. 6 (1833). **Chrysophanus,** Meyr., "Hndbk.," p. 345 (1895).

Cyaniris was first described by Dalman as subdivision iii of his heterotypical group *Zephyrus*, which he says is divisible into three very marked subdivisions—(1) *Aurotis*, (2) *Heodes*, and (3) *Cyaniris*. His description (*Vet. Akad. Handl.*, p. 63) reads as follows:

> *Cyaniris*.—Antennarum clava brevior distinctior. Alæ rotundatæ posteriores ad angulum ani non productæ. Color sæpius supra cyaneus, cœruleus, l. obscure fuscus, subtus canescens, punctis ocellaribus—*Zephyrus argianus*, etc.

In the same work, p. 94, he repeats the diagnosis, but in different words:

> Division iii.: *Cyaniris*.—Antennarum clava brevior distinctior. Alæ ad angulum analem nec caudatæ, nec productæ, colore sæpius supra cyaneo, cœrulescente, rarius fusco, subtus canescente punctis ocellaribus.
>
> Section i.—Alis posticis subtus absque fascia maculari fulva—*Zephyrus arion*, *Z. alcon*, *Z. cyllarus*, *Z. argianus*, *Z. argiolus*, *Z. alsus*.
>
> Section ii.—Alis posticis subtus fascia maculari fulva intramarginali—*Z. icarius*, *Z. adonis*, *Z. alexis*, *Z. agestis*, *Z. eumedon*, *Z. optilete*, *Z. battus*, *Z. argus*.

The name was next used by Billberg, in 1820 (*Enum. Ins.*, p. 80), who (*teste* Scudder, *Hist. Revis.*, p. 150) placed under it all Dalman's species, excepting *alcon*, and several additional species. The name was then used, in 1836, by de Villiers and Guenée in their *Tab. Syn. Lep. Eur.*, i., p. 19. The authors note it as a group of their comprehensive genus *Polyommatus*, and divide it into a number of less important divisions. They diagnose it, and subdivide it as follows:

> *Chenilles* légèrement pubescentes, convexes, avec la partie postérieure un peu déprimée. *Chrysalides* un peu oblongues. *Imagines* les quatre ailes ordinairement entières, arrondies, presque toujours bleues dans les mâles; dessous avec beaucoup de points ocellés, et la base des inférieures verdâtre ou bleuatre—*Cyaniris*, Dalm. (*Argus*, Bdv.).
>
> Division i.—Dessous des inférieures offrant une serie de taches fauves lunulées plus ou moins sensibles.
>
> Section i.—Ailes inférieures ayant en dessous, à la moitié de leur largeur et près du bord terminal, un espace blanchâtre assez large, mais court—
>
> (*a*) Frange entrecoupée—*corydon*, Fab., *agestis*, Ochs. (*artaxerces*, Fab., *titus*, Fab.), *adonis*, Fab. (*ceronus*, Hb.).
>
> (*b*) Frange non entrecoupée—*dorylas*, Fab. (*golgus*, Hb.), *alexis*, Fb., *escheri*, Hüb., *eros*, Ochs.
>
> Section ii.—Point d'espace blanchâtre au bord marginal des inférieures en dessous—
>
> (*a*) Frange non entrecoupée—*icarius*, Ochs., *argus*, Linn. (*calliopis*, Bdv.), *aegon*, Ochs., *optilete*, Fab.

(*b*) Frange entrecoupée—*battus*, Ochs., *hylas*, Fab. (*panoptes*, Hb.).

Section iii.—L'espace blanchâtre plus rapproché de l'angle anal, et formant deux grosses taches dépassant la série antémarginale, et souvent marquées d'un point noir—*orbitulus*, Ochs. (*aquilo*, Bdv.), *donzelii*, Bdv., *eumedon*, Ochs.

Division ii.—Point de série antémarginale de taches fauves lunulées sous les inférieures.

Section i.—Des faisceaux de poils sur le disque des ailes supérieures, ou une bandelette blanche longitudinale sous les inférieures, remontant presque jusqu'à la base. Ailes inférieures toujours un peu, quelquefois fortement, échancrées près de l'angle anal dans les femelles—*damon*, Fab., *dolus*, Hüb., *rippertii*, Bdv., *admetus*, Ochs., *meleager*, Fab. (*cinnus*, Hüb.).

Section ii.—Point de faisceaux de poils ni de bandelette, ailes très-entières—

(*a*) Pas de points noirs sur la surface supérieure des ailes—*iolas*, Ochs., *acis*, Ochs., *sebrus*, Hüb., *alsus*, Fab., *argiolus*, Linn., *pheretes*, Ochs., *cyllarus*, Fab., *melanops*, Bdv. (*saportae*, Hüb.), *marchandii*, Bdv., *lysimon*, Ochs.

(*b*) Une bande arquée de points noirs sur les ailes supérieures, au moins dans l'un des deux sexes—*erebus*, Ochs., *alcon*, Fab., *euphemus*, Ochs., *arion*, Linn.

So far, the name had only been used in a most heterotypical sense for all the "blues," and even then only as a sectional name of *Zephyrus*, Dalm., and *Polyommatus*, Vill. and Guenée, which, although called genera, were really divisions equal to our superfamily *Ruralides*, and comprised the "hairstreaks," "coppers," and "blues." By illustrating the original diagnosis of *Cyaniris* by *argianus* (*semiargus*), however, Dalman fixed the latter species as the type of *Cyaniris* from the inception of the name. The later selection of *argiolus* as type, by Scudder, in 1872 (*Sys. Rev.*, p. 55), was, therefore, altogether *ultra vires*, as also was its maintenance by the same author, in 1875 (*Hist. Sketch*, p. 151). Up to this time, practically nothing had been known of Dalman's name, and hence, Moore, recognising the need of separating *argiolus* and its Indian allies from the crowd of "blues" with which they were placed, unfortunately followed Scudder (*Lep. Cey.*, i., p. 74), and was followed, in turn, by de Nicéville (*Journ. As. Soc. Bengal*, iii., pt. 2, p. 67), Distant (*Rhop. Malay.*, p. 210), Doherty, etc. It was not until 1906 that Prout, working through the early authors *de novo*, with the idea of helping us to fix the generic types, discovered that Dalman had taken *argianus* (*semiargus*) to illustrate his Zephyrid section *Cyaniris*, and thus fixed the type at the time the name was created. This led us to note (*Ent. Rec.*, xviii., p. 131):—

> 1816.—CYANIRIS, Dalman.—Only *argianus* (=*semiargus*) cited in the generic synopsis (*Vet. Ak. Hand.*, p. 63), therefore, this is the type.

This was repeated almost contemporaneously (*anteà* vol. viii., p. 313), and has since been pretty generally used in the restricted sense here indicated in this work, as well as in the faunal records of many British collectors.

Until quite recently it had been accepted almost as an article of faith that *semiargus* was closely allied to *minimus*, and one finds the two species in close proximity in most of the recognised Catalogues. This supposed alliance has been based on the most superficial characters, chiefly the similarity of the spotting and general appearance of the underside of the wings of the two species. But this assumption is contradicted by the structural details of every stage of the two species—egg, larva, pupa, and imago, and we have already pointed out (*anteà* pp. 41-43) that *minimus* belongs to the Everid, whilst *semiargus* belongs to the Plebeiid, branch of the Lycænids, so that they fall not only in different genera, but in different tribes. A mere glance at the plates illustrating the ancillary appendages of the Everids (pl. ii and pl. iii) and Plebeiids (pls. xx, xxi, xxii) will be sufficient to show not only how different is *Cyaniris semiargus* in this respect from *Cupido minimus*, but also how like it is to *Polyommatus*, *Agriades*, etc. Similarly, on the spotting of the underside and other superficial characters, *semiargus* has been attached to *cyllarus*, *melanops*, and the species belonging to *Glaucopsyche*, Scud., although they have been grouped chiefly under the generic name *Nomiades*, Hb., which, unfortunately, falls as a synonym of *Cyaniris*, both having had the same species, *semiargus*, fixed as their type. It is only quite recently that we have determined that *lygdamus*, *cyllarus*, *melanops*, and their allies, must be placed under the name *Glaucopsyche*, and that the genus belongs, not to the Plebeiid, but to the Lycænid (*sens. strict.*), branch of the "blues" (see *Ent. Rec.*, xxi., p. 130), so that *semiargus* is really as far removed from *Glaucopysche* (*cyllarus*) as from *Cupido* (*minimus*). We have already indicated that *Cyaniris* is a true Plebeiid, and shown that it is somewhat difficult to separate in its restricted sense from *Polyommatus*, *Agriades*, etc. (see *anteà* pp. 154-157). It is clearly a mere offshoot of the genus *Polyommatus*, to which it is so closely allied, that it is difficult to find really well-marked characters to separate them. The Palæarctic species—*semiargus*, Rott., *persephatta*, Alph., and *coelestina*, Eversm., are readily distinguishable from the species of the allied genus.

The Cyanirid egg is very specialised, very small for the size of the insect (see Clark's photograph, *Practical Hints*, pt. 3, pl. iii., fig. 4, and Tonge's in the present volume), the surface reticulation very fine, compared with that of the eggs of typical Plebeiids, *e.g.*, *Polyommatus icarus*, *Agriades coridon*, etc., the sculpturing quadrilateral rather than triangular, the pillars short and broad, the micropylar area exceedingly small. The eggs are laid on the calyces of the foodplants (of which *Trifolium pratense* is the favourite in the case of *Cyaniris semiargus*), the egg-stage is comparatively short, rarely exceeding 14 days in either brood.

The Cyanirid larva, like those of the Everids, is rather a flower- and fruit-eater, than a leaf-eater, like the greater number of Plebeiid species; but it thrives on leaves if flowers are not available. Like the mass of Plebeiid larvæ, however, it hybernates in its third stadium; and, like them also, is not averse to producing "forwards" under suitable conditions, *Cyaniris semiargus* being, indeed, one of our most persistently partial double-brooded species in the plains of central and southern Europe. The length of the larval life of the summer brood only lasts about 36 days, that of the hybernating brood nearly 9 months.

The general form of the larval body is much like that of other Plebeiid larvæ. The small black head, the long prothorax or "neck," for boring purposes, and pallid colour (especially when young) suggest very strongly its habits as a more or less internal feeder; the skin-structures are exceedingly weak, although the general arrangement of the hairs, lenticles, etc., is the same as obtains throughout the Plebeiids. Chapman says that, as compared with the young larva of *Plebeius* (*argus*), that of *Cyaniris* (*semiargus*) has much slighter skin-development; the hair-bases in the latter are about half the height and half the width of those of the former, the setæ (i) are much more slender, and only about two-thirds the length, the lenticles are little more than half the diameter, and the very skin-points smaller, fainter, and less chitinised. The young larva of *Cyaniris* (*semiargus*) is, indeed, of all the larvæ so far examined, the one that has the weakest hairs; those of *Agriades* (*bellargus*), *Celastrina* (*argiolus*), and others, are weaker than those of *Plebeius argus* (*aegon*), but they are very decidedly more strongly armed than the larva of *Cyaniris semiargus*. The differences in the larval armature of the various species will be best gathered from a careful examination of our plates illustrating them (of course, making due allowance for any differences of enlargement). The flattened prothorax and anal segments are rounded, and give the front and hind ends of the larva a very similar appearance, although the front part of the body is narrower than the hinder part; the segmental incisions deep, the centre of each segment rising into a dorsal ridge, along which is a slight median furrow, the sides slope down from the ridge to the well-developed lateral flange that limits the somewhat flattened ventral surface; the skin-structure may be best studied from our illustrations; the prothoracic plate, the lenticles, the honey-gland of the 7th, and the eversible caruncles of the 8th abdominal segments, are all well-developed. Symbiosis between ants and the larva of *Cyaniris* (*semiargus*) has not yet been observed.

The pupa of *Cyaniris* has a distinct waist separating the thoracic and abdominal areas, which are both swollen dorsally, the ventral area forming, however, an almost straight line; it closely resembles the pupa of *Plebeius* (*argus*) in form and coloration, but is larger and less slender; it also appears naked, but is sparsely covered with hairs, and very fine spiculæ; the peculiar structural development of the end of the maxillæ in *Plebeius* and *Polyommatus* (*anteà* p. 226) is less developed in *Cyaniris*, although noted there as being similar (Chapman); the 9th and 10th abdominal segments are bent under ventrally, and both provide a few cremastral hooks, those on the 9th abdominal medially on the extreme border, those on the 10th abdominal on either side of the terminal margin; they are, however, without being incapable of use, insufficient to support the pupa, the larva spinning a few loose supporting threads in the form of a weak cocoon, as well as a very inefficient median girth and anal pad.

It may be here noted that Meyrick separates (*Handbook*, etc., p. 344) our *Cyaniris* (*semiargus*), *Aricia* (*astrarche*), *Cupido* (*minimus*), *Everes* (*argiades*), from the rest of the "blues," uniting them with *Rumicia phleaes* and *Chrysophanus dispar* under the legend "Eyes glabrous," in his genus *Chrysophanus*, the rest of the "blues" being noted as having "Eyes hairy," and placed in his genus *Lycaena*. It may not be out of place here to call attention to Staudinger's remark on this point (*Stett. Ent. Ztg.*, 1862, p. 265). Here, he says, "Lederer classifies (*Wien. Ent. Monats.*, 1857, p. 28) *L. semiargus* (*acis*) with the species having naked eyes, but an ordinary magnifying-glass has been sufficient to prove, in all specimens examined, the presence of a distinct, dense, cover of hairs." It would appear that Meyrick, in following Lederer's assumed facts, had overlooked Staudinger's criticism and contradiction of them. We may here note that the neuration of the "blues" and "coppers" being practically identical throughout—forewings with 6 separate, 8 and 9 stalked—offers no useful data for the natural subdivision of the large number of species in these groups, and we still await the

Plate XXXIV.

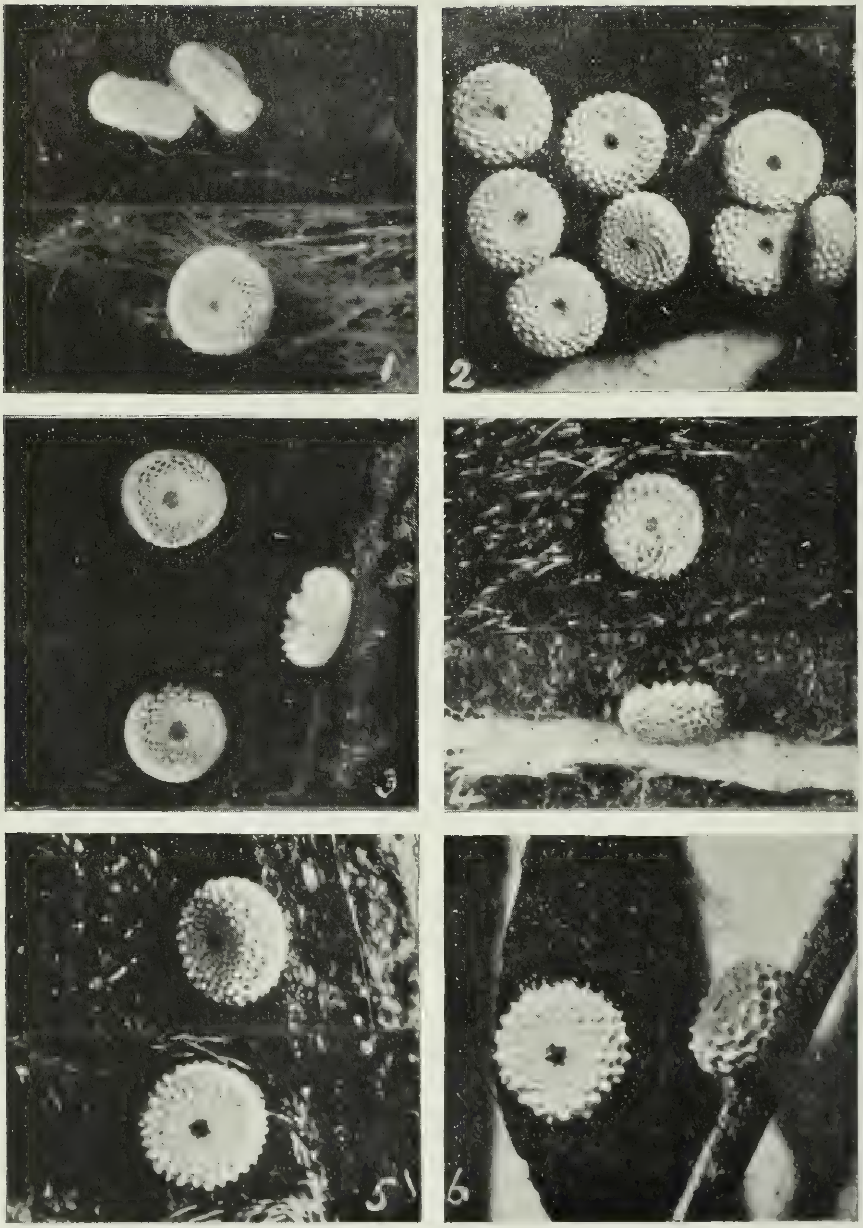


Photo. A. E. Tonge.

Eggs of British Lycænids (× 20).

1. Cyaniris semiargus. 2. Polyommatus icarus. 3. Aricia astrarche.
4. Aricia var. artaxerxes. 5. Agriades thetis (bellargus).
6. Agriades coridon.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 253.]

PLATE LIII.

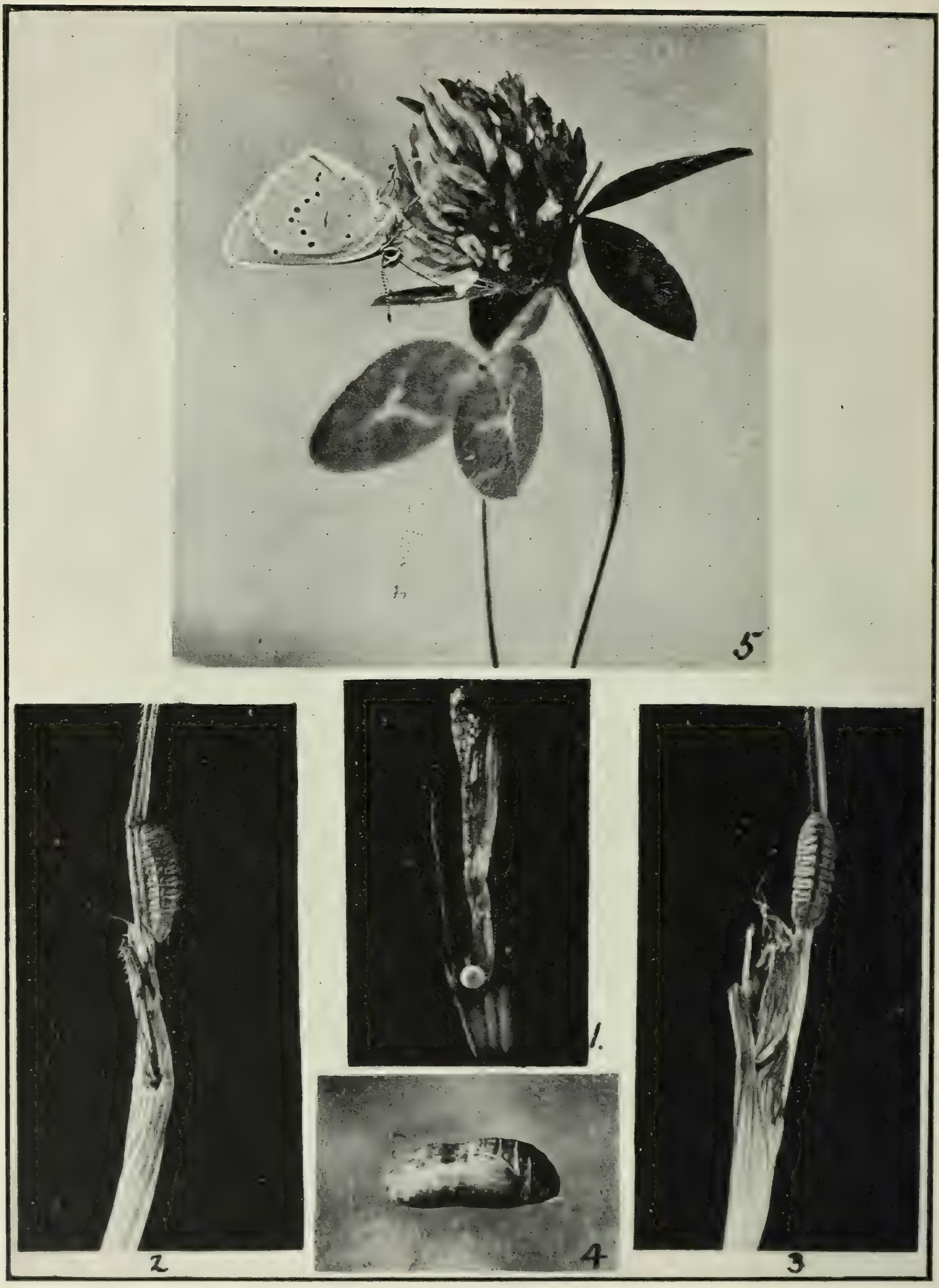


Photo. H. Main and A. E. Tonge.

CYANIRIS SEMIARGUS, V. ROTT.

FIG. 1.—OVUM (IN SITÛ) × 5. FIGS. 2 AND 3.—LARVA ON FOODPLANT.
FIG. 4.—PUPA × 2. FIG. 5.—IMAGO (NAT. SIZE).

A Natural History of the British Butterflies, etc., 1909.

[*To face p. 253.*]

detection of other imaginal characters that will be useful for the purpose. At present, the genitalia stand alone in supporting any characters afforded by the earlier stages and habits. The genitalia of *Cyaniris* have already been described (*anteà* pp. 156-7).

The determination of the actual species to be included in our limited genus lies with the future. At present, *C. semiargus*, Rott., *C. coelestina*, Evers., *C. alticola*, Christoph, and *C. persephatta*, Alph., are the only species that may certainly be referred here. The ♀ s of these species are not dissimilar in general appearance (except in size), but *C. persephatta* does not exhibit any of the marked sexual colour dimorphism that characterises *C. semiargus* and *C. coelestina*, the ♂ and ♀ both being brown, the ♂ alone having, in fine specimens, a few blue hairs at the base of the wings. They are all purely Palæarctic in their distribution, *C. semiargus* having an extended range over the whole of Europe and Asia, *C. coelestina* in the Russian Urals, *C. alticola* (perhaps a local form of *coelestina*) in Russian Armenia, *C. persephatta* occurring locally only in Central Asia.

Cyaniris semiargus, von Rottemburg.

Synonymy.—Species: **Semiargus,** Rott., "Naturf.," vi., p. 20, no. 6 (1775); Göze, "Ent. Beitr.," iii., pt. 2, p. 55 (1780); Geoffr., "Fourc. Ent. Paris.," p. 245 (1785); Bkh., "Sys. Beschr.," i., pp. 172, 282 (1788); ii., p. 234 (1789); Herbst, "Nat. Syst. Ins.," xi., p. 177 (1804); Oken, "Lehrb.," ii., p. 718 (1815); Hein., "Schmett. Deutschl.," i., p 73 (1859); Staud., "Cat.," 1st. ed., p. 6 (1861); Kirby, "Man.," p. 110 (1862); Rössl., "Schmett. Nass.," p. 16 (1866); Snell., "De Vlind.," i., p. 57 (1867); Berce, "Fn. France," p. 147 (1867); Nolck., "Lep. Fn. Estl.," i., p. 58 (1868); Kirby, "Syn. Cat.," p. 372 (1871); Staud., "Cat.," 2nd ed., p. 14 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 104 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 394 (1874); Curò, "Bull. Soc. Ent. Ital.," vi., p. 113 (1874); Scudd., "Hist. Sketch," p. 228 (1875); Sand, "Lép. Ber. Auv.," p. 7 (1879); Peyerim., "Lép. Als.," p. 25 (1880); Rössl., "Lep. Wiesb.," p. 31 (1881); Kirby, "Eur. Butts.," p. 46 (1882); Jourdh., "Lép. Aube," p. 19 (1883); Lang, "Butts. Eur.," p. 129, pl. xxxi., fig. 5 (1884); Kane, "Eur. Butts.," p. 49 (1885); Lampa, "Ent. Tids.," vi., p. 15 (1885); Kill., "Ins. Graüb.," p. 21 (1886); Auriv., "Nord. Fjär.," p. 15 (1888); Rühl, "Pal. Gr.-Schmett.," pp. 296, 767 (1892-5); Meyr., "Hndbk.," p. 345 (1895); Tutt, "Brit. Butts.," p. 164, pl. ii., figs. 8-9 (1896); Kirby, "Hndbk.," etc., ii., p. 106, pl. xlix., figs., 6-7 (1896); Grote, "Schmett. Hild.," p. 42 (1897); Favre, "Macr.-Lép. Val.," p. 23 (1899); Staud., "Cat.," 3rd ed., pt. i., p. 89 (1901); Fleck, "Macr.-Lep. Rumän.," p. 22 (1901); Lamb., "Lép. Belg.," p. 246 (1902): Wheel., "Butts. Switz.," etc., p. 25 (1903); South, "Brit. Butts.," p. 177, pl. cxv., figs. 9-12 (1906); Tutt, "Nat. Hist. Brit. Lep.," viii., p. 313 (1906); "Ent. Rec.," xviii., pp. 131-2 (1906). **Acis,*** Schiff., "Schmett. Wien," 1st ed., p. 182 (1775); Lang, "Verz.," 2nd ed., p. 56 (1789); Scriba, "Journ.," p. 119 (1791); Bkh., "Rhein. Mag.," i., p. 283 (1793); Ill., "Schmett. Wien," 2nd ed., p. 264 (1801); Schrank, "Fn. Boica," ii., pt. i., p. 210 (1801); Herbst, "Nat. Sys. Ins.," xi., p. 177, pl. cccx., figs. 1-3 (1804); Lasp., "Ill. Mag.," iv., p. 63 (1804); Latr., "Hist. Nat. Crust.," xiv., p. 120 (1805); Ochs., "Schmett. Sachs.," p. 306 (1805); "Die Schmett.," i., pt. 2, p. 14 (1808); iv., p. 25 (1816); Hb., "Verz.," p. 67 (1816-18); Godt., "Enc. Méth.," ix., p. 703 (1819); "Pap. Fr.," i., p. 224, pl. xi. *sec.*, fig. 7, pl. xi. *quart.*, fig. 4 (1821); Curt., "Brit. Ent.," fo. 9 (1824); Stephs., "Illus. Haust.," i., p. 86 (1828); "Ins. Cat.," 1st ed., ii., p. 23 (1829);

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* Ochsenheimer writes (*Die Schmett.*, i., pt. 2, pp. 14-15, footnote): "Although in the Schiffermüller collection, which I have examined, *Papilio argiolus*, Linn., is found under the name *P. acis*, by which Fabricius and Hübner were both led into error, the specific characters of *P. acis* and the remarks of the authors (*Schmett. Wien*, p. 183) allow of no doubt that they recognised in their *P. acis* the present species, and in *P. argiolus* the Linnean species of this name. The name *semiargus* is to be preferred as the older, but it is compounded and, therefore, against the rule for the construction of names."

Bdv., “Eur. Lep. Ind.,” p. 13 (1829): Meig., “Eur. Schmett.,” ii., p. 6, pl. xlvi., figs. 4*a-c* (1830); Koll., “Verz. Schmett. Oestr.,” p. 8 (1832); Dup., “Pap. Fr.,” supp. i., p. 390 (1832); Cant., “Lép. Var,” p. 6 (1833); Ramb., “Faun. And.,” p. 274 (1839); Bdv., “Gen. et Ind. Meth.,” p. 12 (1840); Humph. and Westd., “Brit. Butts.,” p. 102, pl. xxxi., figs. 9-11 (1841); Neüst. and Korn., “Schmett. Schles.,” pt. 1, p. 44, pl. xx., fig. 65 (1842); H.-Sch., “Sys. Bearb.,” i., p. 116 (1843); Evers., “Faun. Volg.-Ural,” p. 44 (1844); Dup., “Cat. Méth.,” p. 31 (1844); Freyer, “Neu. Beitr.,” v., p. 155, pl. ccccli., fig. 4 (1845); Nick., “Lep. Fn. Böhm.,” p. 18 (1850); Stphs., “List,” 1st ed., p. 2 (1850); Dbldy., “Syn. List,” 1st ed., p. 1 (1850); Hdnrch., “Lep. Eur. Cat.,” p. 13 (1851); Meyer-Dür, “Schmett. Schweiz,” p. 89 (1851); Westd. and Hew., “Gen. Diurn. Lep.,” ii., p. 492 (1852); Led., “Verh. zool.-bot. Gesell.,” ii., p. 19 (1852); Wllgrn., “Skand. Dagf.,” p. 238 (1853); Gerh., “Mon. Schmett.,” p. 9, pl. xiii., figs. 4*a-c* (1853); Mén., “Cat. Mus. Petr.,” p. 57 (1855); Stephs., “List,” 2nd ed., p. 17 (1856); Koch, “Schmett. Deutsch.,” p. 27 (1856); Stn., “Man.,” i., p. 58 (1857); Ramb., “Cat. Lép. And.,” p. 42 (1858); Speyr., “Geogr. Verb.,” i., p. 247 (1858); Dbldy., “Syn. List,” 2nd ed., p. 1 (1859); Zebr., “Lep. Krak.,” p. 155 (1860); Newm., “Brit. Butts.,” p. 133 (1871); Frey, “Lep. Schweiz,” p. 21 (1880); Dale, “Hist. Brit. Butts.,” p. 56 (1890); Barr., “Lep. Brit. Isl.,” i., p. 94, pl, xiv., figs. 2-2*b* (1893). **Argiolus,** (?) Fab., “Sys. Ent.,” p. 525 (1775); Fuess., “Verz.,” p. 31 (1775); Esp., “Schmett. Eur.,” pl. xxi., figs. 1*a*, *b* (1777); i., p. 277 (1779); Göze, “Ent. Beitr.,” iii., pt. 2, p. 26 *in part* (1780); Fab., “Spec. Ins.,” ii., p. 123 (1781); Schneid., “Sys. Beschr.,” p. 269 (1787); Fab., “Mant. Ins.,” ii., p. 73 (1787); “Ent. Sys.,” iii., pt. 1, p. 295 (1793); Hb., “Eur. Schmett.,” pl. lvi., figs. 269-271 (1796); Hffmgg., “Ill. Mag.,” iii., p. 186 (1803); Panz., “Schäffer's Icones,” 2nd ed., p. 163, pl. clxxxv., figs. 1, 2 (1804); Hb., “Eur. Schmett.,” text p. 45 (1805). **Byzas,** Bergs., “Nomen.,” ii., p. 79, pl. xlviii., figs. 5, 6 (1779). **Byze,** Bergs., “Nomen.,” ii., p. 79, pl. xlviii., figs. 7, 8 (1779). **Argopoeus,** Bergs., “Icon. Pap. Diurn.,” dec. i., pl. iii., figs. 7, 8 (1779); dec. ii., pl. iii., figs. 5, 6 (1779); “Nomen.,” iii., p. 8, pl. lii., figs. 7, 8 (1779). **Byzenus,** Bergs., “Icon. Pap. Diurn.,” dec. i., pl. x., figs. 1, 2 (1779); “Nomen.,” iii., p. 14, pl. lvii., figs. 1, 2 (1779). **Byzene,** Bergs., “Icon. Pap. Diurn.,” dec. i., pl. x., figs. 3, 4 (1779); “Nomen.,” iii., p. 14, pl. lvii., figs. 5, 6 (1779). **Damoetas,** Bergs., (*nec* Schiff.), “Icon. Pap. Diurn.,” dec. i., pl. x., figs. 5, 6 (1779); “Nomen.,” iii., p. 14, pl. lvii., figs. 5, 6 (1779). **Argopoei,** Bergs., “Nomen.,” iii., p. 19, pl. lxi., figs. 5, 6 (1779). **Argus** (γ), Rossi, “Fn. Etrus.,” ii., p. 156 (1790); Ill., “Rossi's Fn. Etrus.,” ii., pp. 247-8 (1807). **Cimon,** Lewin, “Ins. Gt. Brit., i., p. 80, pl. xxxviii., figs. 6, 7 (1795). **Cymon,** Haw., “Lep. Brit.,” p. 48 (1803); Leach, “Edin. Enc.,” ix., pt. 1, p. 130 (1815); Sam., “Ent. Comp.,” pp. 242, 381, 417 (1819). **Argianus,** Dalm., “Vet. Ak. Handl.,” p. 95 (1816). **Asis,** Wood, “Ind. Ent.,” p. 8, pl. ii., fig. 63 (1839). **Sebrus,** Hb., “Eur. Schmett.,” pl. 172, figs. 851-853 (1823-1833); **Coelestina,**[**] Mill., “Iconog.,” p. 440, pl. cliv., fig. 3 (1874). [Staudinger in his *Cat.*, 3rd ed., p. 89, gives *saportae*, Dup., i., pl. ix., figs. 5-6, as possibly this species, but it is *sebrus* (*see* Dup., *Pap. Fr.*, supp., i., p. 327—*Cat. Méth.*, p. 31, where Duponchel corrects his error).]

ORIGINAL DESCRIPTION.—*Papilio Plebeius Ruralis semiargus.*—This butterfly was described by Geoffroy[*] (*Hist. abregée*, ii., p. 63, no. 31); Roesel also figured the ♂ (*Der Insekten Belustigung*, vol. iii., pl. xxxvii., fig. 4), but he represented only the underside, for his figs. 3 and 5 represent a different species, and, in his fig. 4, he has omitted the little black dash which the butterfly has in the middle of the hindwings.[†] The upperside of the ♂ is entirely dark blue, shading somewhat into violet; on the margin, all four wings are bordered with black, and have beyond a narrow white border. The ♀ is, on the upperside, quite dark brown, on the underside dark greyish-brown, but otherwise marked just like the ♂. The butterfly appears in June in gardens and meadows, but is not nearly so common as *argus*, Linn. (von Rottemburg).

[**] Staudinger refers to this as a synonym of *Glaucopsyche cyllarus*, but Blachier, like ourselves, considers it an undoubted *Cyaniris semiargus*.

[*] *Papilio* alis rotundatis integerrimis cœruleis; subtus ocellorum fascia solitaria. Le demi-argus: Longueur 5 lignes, largeur 14 lignes. Ses aîles en-dessus sont d'un bleu un peu pourpre; en-dessous elles sont grises, avec une seule bande de petits yeux disposée en arc. Ces yeux sont noirs, entourés d'un cercle blanc. Le bord de l'aîle n'a point de taches fauves. Les antennes, comme celles des papillons de cet ordre, sont composées d'anneaux alternativement blancs et noirs, et terminées par une masse allongée. On trouve ce papillon avec le précédent (*Argus*) (Geoffroy, *Hist. Abregée des Insectes*, ii., p. 63, no. 31).

[†] Roesel evidently regarded these as varieties of one species, see *Insek. Belust.*, iii., pp. 228-9 (Wheeler).

IMAGO.—27mm.-32mm. ♂. Deep purple-blue; with a more or less wide black marginal border; the nervures darker than ground colour; the discoidal lunule generally visible; fringes whitish; underside grey. ♀. Brownish-fuscous, underside grey-brown; fringes grey, paler at apex of forewing. Beneath, in both sexes, a single submedian row of white-margined ocellated spots across fore- and hindwings; the discoidal lunules also edged with white: on the hindwings usually one costal spot between the discoidal lunule and the base; the forewings without basal spots.

SEXUAL DIMORPHISM.—The sexual colour difference is most marked in this species. In their more typical forms the ♂ may be said to be of an uniform purple-blue, with darker margin and nervures, the ♀ unicolorous fuscous, but sometimes with a few blue scales towards the base, at other times, though rarely, well-scaled with blue; the underside of the ♂ is grey of some shade, the ♀ grey with a distinct brown tinge. In the more extreme forms the ♂ is much brighter blue, whilst the ♀ is marked on fore- and hindwings with orange lunules; the underside, too, in these extreme forms, shows the ♀ much more strongly marked with orange than the ♂. In size there is not much difference between the sexes; on the whole the ♀ s are quite as large, or larger, than the ♂ s, in some cases considerably larger. Aurivillius says (*Bih. Svensk. Ak. Handl.*, v., p. 23) the ♂ differs from the ♀ by its blue coloration, and by the androconia, which are arranged in about eight rows; they are narrower than in *Celastrina argiolus*, noticeably convex at the edges, and hence appear pear- or bottle-shaped. Pierce notes (*in litt.*) that "there are eight rows of androconial scales, which are oval in shape, and measure ·001 in. × ·0007 in. The other ♂ wing-scales are (1) the transparent scales, ·004 in. × ·002 in., of a bright yellow colour and quite plain, (2) darker scales, slightly, not deeply, 3- and 4-lobed. The underside scales are very irregular and may be 2-, or 3-, or 4-pointed."

GYNANDROMORPH.—The only record that we can discover of gynandromorphism in this species is the following:—

(a) Complete gynandromorph. Left wings ♀, right wings ♂. The right forewing is somewhat broader and shorter than the left. The right half of the body has the bluish scales that characterise the ♂, but the left is black and hairy like the ♀. Caught by H. Bunge, July 13th, 1906, in a meadow near the Wienebüttel farm (Bunge, *Ent. Zeits. Guben*, xx., pp. 159, 225, with fig., p. 256).

VARIATION.—Compared with many of the allied species, and considering its great distribution, *C. semiargus* affords a comparatively small amount of variation throughout its range from Portugal to Amurland, except in a comparatively limited district in the Orient, extending from the Balkan Peninsula to Persia. Outside this area, which requires to be treated separately, the typical form, with but slight modifications, occurs. Throughout Europe and Asia, there can be no doubt the "plain" or lowland examples are distinctly of a brighter blue than are those from the Alps, even only at a moderate elevation, but this is not without exception. Those in our collection, from Saeterstoen (June-July), Grésy-sur-Aix (mid-August), Chavoire (early August), St. Michel de Maurienne (early August), are distinctly brighter in colour, with very narrow, black, marginal edge without suffusion, whilst the brightest specimens in the British Museum coll. are those from St. Petersburg, England, Eperies, Greece, and Syria. These are bluer, with less purple in their tint, than the mountain races, which are deeper in colour, apart from the broader and more suffused black margin and suffused nervures that help to darken the ground colour. Gillmer states that, in Germany, the blue colour of the ♂ is usually of a deep, more rarely of a lighter, blue tint, with or without a reddish sheen. Blachier says that the ♂s in the lowlying parts of Switzerland are of a more or less bright violet-blue, those of the mountains being darker, although a specimen captured at Altanca, in Ticino, is blue without a trace of violet, yet Knecht states that the ♂s are very dark at Bisbinno, also in Ticino. Reverdin also observes that, the ♂s from the Alps, in his collection, are of a darker colour than those from the lowlands. Two ♂s in our collection, taken at Aigle (May), are of a slaty-blue tint = ab. *plumbea*, n. ab. Two ♂s, somewhat similar in tint, labelled "Malatia, Mesopotamia (Staudinger)," are in the British Museum coll., but have the underside closely approaching that of var. *persica;* these specimens are the types of our var. *mesopotamica*, n. var. The occasional development of beautiful pinky-red marginal spots on the upperside of the hindwings in the ♂ of the lovely var. *antiochena*, needs only to be referred to here. Various ♂s of this species show considerable difference in the width of the dark margin on the upperside of all the wings, although, according to our observation, the width is rather racial than otherwise. It appears to matter little whether the specimens be taken in a moderately high or low latitude, provided the ground is open and little above sea-level, the colour is generally brighter, and the marginal band narrow, *e.g.*, in England (both broods), Norway—Saeterstoen (June, only brood), Grésy-sur-Aix, Chavoire, foot of Grand Salève (late July and August, second brood); examples from these places in our collection have quite narrow borders. In the British Museum coll., those from St. Petersburg, Hungary, Greece, Syria, Mesopotamia, Central Asia, all show narrow borders, apparently racially. The narrow-bordered form, as represented by the British, Norwegian (Saeterstoen), lowlands of France, and German examples clearly belongs to *cymon*, Lewin (= *angustimargo*, Gillm.), whilst those with somewhat wider borders, but of the same type in general colour, etc., are the *semiargus*, v. Rott., described originally, we believe, from central German examples (=*latimargo*, Gillm.); *acis*, Schiff., is most probably the large, bright, narrow-margined form that occurs freely in the lowlands of Austria-Hungary. It is to be noted that whilst the Oriental forms belonging to Greece and Syria have quite narrow bands, those belonging to Bulgaria and Persia have broad bands. This alone is sufficient to prove that the figure of *bellis*, Frr., is the Grecian form of this species (and it is absolutely identical with the specimens sent out by Staudinger as *parnassia*, in colour, width of margin, and size), whilst the wider-margined Persian race disagrees entirely with Freyer's figure of *bellis*, and certainly should not have been referred thereto by Staudinger. There are some two dozen examples of these Persian forms in the British Museum coll. alone, sent out by Staudinger as *parnassia* and *bellis*, showing that he had distributed this race widely under wrong names. The specimens with the widest borders, in our collection, come from the Val Véni and Mont de la Saxe, in Piedmont; the Brévent, in Savoy; Evolène, the Bricolla Alp, Andermatt, Fusio, and the Simplon (widest of all) in Switzerland, Lölling and the Kor Alpe, in Carinthia, whilst, in the British Museum coll., the widest-margined examples come also from Courmayeur, the Ticino valley, Bergün, and the Pyrenees, at 5000ft. or 6000ft., and, as already noticed, the Bulgarian (Rilo) and Persian races have exceedingly good borders. It will be seen that practically all these wide-margined examples come from high, or moderately high, elevations, and these are wide, in a sense that the wider-margined examples from central Europe (=*semiargus*, Rott.) rarely reach. Rowland-Brown notes that the specimens from the central Alps show much wider and deeper black margins than those taken lower down, and Blachier adds that he finds the band wider and more suffused interiorly in the specimens from the mountains than those captured in the lower country. These wide-margined examples from the Alps, up to at least 4000ft., are not wanting in size, indeed, some are of more than average size, hence, although they show in colour, width of band, suffusion, spotting, etc., the general characters of the mountain race, they are not referable to *montana*, Meyer-Dür, as limited by that author, and we call them in our collection var. *montana-grandis*, n. ab. Connected with the marginal band of the hindwing is a most interesting aberrational feature, *viz.*, the development of little sagittate or cuneiform prolongations between the nervures, so that the wing appears ornamented with points growing out of the black border=ab. *dentata*, n. ab. Reverdin observes that, in many of his ♂s, the black margin, instead of terminating in a more or less diffuse manner on its inner border, presents, in the middle of the interneural spaces, a rounded projection which gives the idea of black points, of which the outer half is lost in the border and the inner half projects into the blue ground colour of the wing; examined under a lens, these examples recall the disposition of the black marginal points of certain *Plebeius argus* (*aegon*); among others, two ♂s from Arolla (June 14th, 23rd, 1907), and a ♂ from Gondo (July 9th, 1907) are very characteristic in this respect, and it may be here noted that these three ♂s present, on the underside, indications of brown marginal spots beneath in the same position. Blachier says that he has an example from the Laquinthal with five of these interneural toothed points on each of the hindwings. It may also be here noted that Bergsträsser's *byzas* shows a similar marginal row of interneural spots on the hindwings. There is considerable variation in size in the species, in both sexes, occasionally as an aberration, more often racially. It is generally stated that the alpine examples are smaller than those from the plains, but such a sweeping assertion requires a great deal of modification. In the British Museum coll., the largest European examples come from Berlin, Hungary, Bulgaria, Bosnia, Ticino, Zürich, whilst the ♀s from Courmayeur (4000ft.), Bergün (4550ft.), and the Tyrol are also sometimes of large size; also large in size are both sexes from the Pyrenees, the Urals, Mongolia, the Altai, and Amurland; in our collection the largest examples come from Ticino—Fusio (early July), Locarno (June), Carinthia — Lölling, Sau-Alpe (mid-July), Tyrol—Campiglio (mid-July), Valais—Simplon (early August). The smallest specimens in the British Museum coll., are those from Morea, the Lebanon Mountains, Portugal, Norway, certain parts of the Taunus Mountains, and of the Grisons, whilst, the smallest in our own collection come from Pontresina (July, only brood), Roche (early August, second-brood), St. Michel-de-Maurienne (early August, second-brood), Grésy-sur-Aix (mid-August, second brood), Larche (late July, 6000ft., only brood). Approaching the smaller races, but mixed in size, are specimens from the Brévent (August), Arolla (August), Le Lautaret (August), Val Véni (August), Mont de la Saxe (August), Bricolla Alp (August), Combe d'Arolla (August), Guarda (July), all high alpine localities, where the insect is only single-brooded. On the whole, therefore, the high mountain examples are racially not smaller than the second-brood of the plains. No doubt Meyer-Dür's comparison (*posteà*, p. 269) was made against the large lowland specimens of the plains. These mountain specimens average about 27mm.-28mm.; he says, " the size of average *Vacciniina optilete*, or lowland *Plebeius aegon*." Even the highest mountain races rarely measure less than 27mm. (measuring from apex of wing to mid-thorax and doubling), although occasional examples may go down to 25mm., whilst the smallest aberrational specimens of the plain rarely run under 25mm. or 26mm. These small examples we call ab. *minor*, n. ab. The largest examples in the British Museum coll. measure—♂ s 38mm. (Bulgaria), 38mm. (Eperies), 37mm. (Ural), etc.; ♀ s 39mm. (Bulgaria), 38mm. (Eperies), 38mm. (Sutschan). The smallest are ♂ 25mm. (N. Syria), 26mm. (Luchon, Pyrenees), 27mm. (Syria); ♀ s 26mm. (Bergün), 26mm. (Greece). Lowe says that the largest ♂ s in his collection are 35mm. (Bozen, La Granja); ♀ s 35mm. (La Granja), 32mm. (Eclépens); the smallest ♂ s 25mm. (Trafoi), 26mm. (Martigny), ♀ s 29mm. (Pontresina, Eclépens), small examples being typical at Trafoi, but quite exceptional at Eclépens, and large ones typical of La Granja. Mann states (*Iris*, viii., p. 40) that the examples from the Dobrudscha are much larger than those found near Vienna. Reverdin notes (*in. litt.*) that the largest ♂ in his collection (65 examples) measures 30mm. (32mm.)* and came from the Laquinthal (July), the largest ♀ 28mm. (32mm.) from the Kienthal (August), the smallest ♂ 22mm. (23mm.) from the Petit Salève (September), the smallest ♀ 22mm. (25mm.) from Arolla (July), all alpine localities except perhaps the Petit Salève. The otherwise typical examples above 34mm., we call ab. *major*, n. ab. As a matter of fact, apart from the very large examples that come from the lowlands of Central Europe—Berlin, Eperies, etc.—those from the lower valleys of the Alps, *i.e.*, at a moderate elevation, are quite as large as the average specimens from the lowlands of various other parts of Europe and Asia, and much larger than many of the examples of the second broods of the plains; although those from the highest and most exposed alpine localities do certainly become smaller and darker, as many collectors have noticed. Rowland-Brown observes that he has such from the Val d'Anniviers, Val d'Hérens, the Saas-Thal, and above Allos, whilst Grund observes (*Int. Ent. Zeit. Gub.*, ii., p. 87) that " small ♂ s with broad black borders are not rare in the Agram district." Meyer-Dür's generalisation of a gradual lessening in size, from the lowest to the highest elevations, must therefore be accepted with the greatest caution. The colour of the upperside of the wings in the females is of two distinct shades of fuscous (1) brownish-fuscous, (2) blackish-fuscous. The blackest-coloured ♀ s in the British Museum coll. come from Courmayeur, Luchon, Fusio, Rilo Dagh, Bosnia, and the Altai. A very pale fuscous ♀ from Granada shows a tendency to the development of a pale marginal band of lunules on the upperside of all the wings, a most unusual line of development, the extreme bases of the wings also are slightly tinged with blue. The darkest ♀ s in our collection come from Canales, Moncayo, Larche, the Brévent, Aigle, the Simplon, Pontresina, and Guarda, but somehow one has doubts whether the ♀ s are not all blackish-fuscous when quite freshly emerged. Gillmer describes (*Int. Ent. Zeits. Guben*, ii., pp. 312-313) a large ♀ under the name of ab. *flavescens*, which he says has "the ground colour of the upperside of a yellow tint, without reaching the yellow colour of *Plebeius argyrognomon* ab. *lutea*, Car.; a similar ♀ is noted by Wadzek (*Ins. Börse*, xxiii., p. 68). Muschamp notes (*in litt.*) a ♀ of a pale slaty-grey colour taken near Geneva. Such European ♀ s as have come under our notice are very rarely tinged with blue even at the base (= *byze*, Bergsträsser). There are some specimens in the British Museum coll. without data, assumed, without any real knowledge, however, to come from "Germany," with the bases of the wings, sometimes to the disc or even beyond, quite conspicuously scaled with blue, but Gillmer states that the German ♀ s are usually unicolorous brownish-black, sometimes, however, scaled with blue near the base; Grund observes that, in the Agram district, the ♀ s are seldom dusted with blue on the upperside, and even then, only weakly at the base; there is, also, in the British Museum coll., a ♀ from "Meiringen" fairly well-scaled with blue, and the pale example from Granada, already noted, has the bases slightly blue. The ♀ s from Central and Eastern Asia appear to be entirely dark fuscous-brown. The Oriental races are very remarkable in the fact that the European ♀ examples of the special races of the Balkan Peninsula, allied as they are to those of Asia Minor, Syria and Persia, are practically without blue scales, whilst those of the countries last named show a strong tendency to blue scaling, those from the Lebanon, var. *antiochena*, being really most brightly tinted and very beautiful. These are noted at length in our descriptions of the various races. The development of orange or fulvous marginal spots on the upperside of the fore- and hindwings is also confined, so far as the large number of specimens examined shows, to the Balkan Peninsula, Syria and Persia; it is beautifully developed in var. *helena*, Staud., in the Morea, and *antiochena*, Led., in Syria. The underside of the ♂ s is generally uniform pearly-grey, differing, however, greatly in the depth of the tint, sometimes very weakly brown, when it is difficult to distinguish from the darker grey-brown or brown of the ♀ s. The bases of the wings on the underside are usually more or less scaled with blue, especially at the base of the hindwings, and generally more strongly in the ♂ s than in the ♀ s. The best-developed example in the British Museum coll., in this direction, is a ♂ from Britain, in which the blue reaches to the discal lunule on the hindwing and almost as far in the forewing, and reminds one somewhat of the underside of *Cyaniris coelestina*, Evers., and *C. alticola*, Christph.; other well-marked examples are from Norway, Ticino, Bosnia, Bulgaria, the Urals, the Altai, Syria, etc. The spotting of the undersides is somewhat variable, although, in the normal examples of Europe and Asia (excluding the strictly oriental races of the Levant), the spots are largely confined on the forewings and hindwings to the discoidal lunules, the submedian transverse row, and one, two, or three spots between the discoidal of the hindwings and the base. The normal number of dots in the submedian series on the forewings is seven, the last two of which often touch one another, and on the hindwings eight, the last two also often touching. The ocellated spots are usually rounded, edged with white, but vary in shape, in some they are slightly elongated in the direction of the nervures, tending to become cuneate; in others they are lengthened in an opposite direction, forming almost subperpendicular streaks between the nervures, as in *Cupido sebrus*, etc. Reverdin observes (*in litt.*) that, in many, the spots are very unequal in size on the same wing; in one ♂ from Arolla, spots one, three, and five, of the left posterior wing (counted from the anterior margin to the anal angle) strike one by their exaggerated size, and by the presence of a commencing pupil, a lens showing some white scales in the black part of the ocelli, but not exactly in the centre. Rebel notes (*Faun. Balk.*, i., p. 193) a "peculiar ♂, taken at Slivno, 26mm. in expanse, normal on the upperside, the ground colour of the underside pale grey, the forewings with a fine black central spot, the submedian row, pushed very near the margin and curving parallel with it, consisting of five black, pale-centred spots, of which the first (in cell one) and the last (in cell five) are distinctly smaller; the ocellated spots of the hindwings are distinctly smaller, but present in the full number; all the wings show white marginal triangles, which are bordered more darkly towards the disc of the wing, and those of the hindwing carry a very fine dark dot in their interior." As between the sexes, the ♀s usually have the spots larger than those of the ♂, but, in the same sex, there is considerable difference; large-spotted forms have been figured and described by Bergsträsser and Zeller, *e.g.*, *byzas*, Bergstr., *byzene*, Bergstr., and *aetnaea*, Zell.; as a matter of fact, the type of the latter presents no other definite aberrational feature, nor does *crassipuncta*, Gillm. The smaller-spotted forms appear to be very generally typical, especially in the ♂s; we have failed to detect any in those we have examined, with very small spots (=ab. *parvipuncta*, Gillm.), unless the number is also reduced; those with the smallest spots in the British Museum coll., have come from Norway, Parnassus, Ussuri, but in almost all these cases the numbers are also lessened. The specimens with tendency to elongation of some of the ocellated spots, in the direction of the nervures, have been twice named, *viz.* *striata*, Wheeler (=*elongata*, Gillm.). Rebel notes (*Lep. Fn. Balk.*, ii., p. 187) a ♀ with a streak-like arrangement of spots on the underside of the forewings from Trebevic. The most magnificent and extreme specimen in this direction, however, is in the British Museum coll.; it is a ♂ (without locality) in which the first five normal spots of the forewings are actually developed into long, thick, black streaks, extending about halfway on either side of the normal position of the spot, the twin-spots 6-7 being almost normal; on the hindwing spots 1-6 are similarly developed, the twin-spots 7 and 8 less markedly lengthened, but 9 (often supernumerary) lengthened for some distance along the inner margin; the discoidal spots on all wings, and the basal on hindwings, normal=ab. *lineata*, n. ab. A similar specimen has been photographed by Krodel, but appears not to have been described or published. In some examples, spots 7 and 8 in the hindwings are united into an U or C (placed sideways) (=ab. *c-nigrum*, n. ab.), forming as it were, an arc, or a reversed crescent; Blachier notes (*in litt.*) a ♂ and ♀ thus marked; and there are also examples in our own and the British Museum coll. There is also considerable variation in the number of the spots on the underside. As already pointed out, the normal number of spots is seven on the fore- and eight on the hindwing. It occasionally happens, however, that there are more than this, we have seen a spot 9 just beyond 8 on the hindwing, also extra, small, spots between the discoidal and the submedian row of the fore- or hindwings=ab. *excessa*, n. ab. Blachier notes (*in litt.*) a ♂ from Simplon in which there are four small, black, white-margined spots between the discoidal lunule and spots 2 and 3 on the right forewing; in the British Museum coll. is a similar specimen, from Lac d'Oo, 4000ft., July, 1902, with an extra, small, white-margined spot between spot 1 and the discoidal lunule, two others between spot 3 and the lunule, on the right forewing and one on the left forewing, whilst spot 4 is much extended; Becher (*Ent.*) says that, at Carlsbad, there is a tendency to vary in the number of spots on the underside, and that a ♂ he captured there has, on the left forewing, two spots shaped like the figure 8 between the discoidal lunule and the usual row of black spots. Keynes observes (*Ent. Rec.*, xviii., p. 176) that he captured a specimen on August 11th, 1905, near the Kaltwasser Gallery, with two extra spots on the underside of the hindwings, between the discoidal lunule and usual submedian row of spots. In the opposite direction there may be a decrease in the number of spots, rarely there are absolutely none=ab. *spadae*, Hellw., and there may be any intermediate number between the normal number and this most obsolete form; these intermediates=ab. *caeca*, Fuchs (*paucipuncta*, Gillm.). This aberration may occur in either sex; is more often found in the fore- than in the hindwings and more frequently symmetrical on the two sides, although sometimes it is asymmetrical. This form with reduced spotting, Gillmer says, occurs more frequently in the ♂. Blachier states that, of the spots that disappear, 6 and 7 of the superior wings and 2 of the inferior wings are wanting in two examples in his collection, whilst another example lacks spot 1 in the forewings and 7 and 8 in the hindwings. He has also a ♂, taken at Les Plans, above Bex, which has only the discoidal lunules and a spot on each hindwing (spot 4), all the other spots being absent. Reverdin observes (*in litt.*) that he finds among the examples in his collection the following:—Forewings: Spot 7 lacking in 5 examples; 6 and 7 in 19 examples; 1 and 7 in 1 example; 1, 6 and 7 in 2 examples. Hindwings: 7 and 8 lacking in 3 examples (the spotting on the forewings being complete). He adds: Examples in which ocellated spots are absent symmetrically in all 4 wings are very rare, but in 6 ♂s and 1 ♀ some spots are absent on all the wings, but asymmetrically in one, from Kienthal, the right forewing has spots 2, 3, 4 and 5, the left forewing spots 1, 2, 3, 4, 5 and 6. Rebel observes (*Lep. Fn. Balk.*, ii., p. 187), that a ♂ from Trebevic shows on the underside of the forewings only the discoidal spot, whilst, on the hindwings, besides the central spot there were only the four most central spots of the outer row. In the British Museum coll. are many examples of both sexes, showing varying degrees of spot-reduction ; it appears to be a general form of aberration, but is particularly frequent in specimens from Norway and Greece ; two very fine examples of *antico-obsoleta*, of the var. *helena*, the submedian row of spots absent on forewings, and almost normal on hindwings, are very interesting. Between the discoidal lunule of the hindwing and the base are a variable number of spots ; there is generally one near the costa of the wing just before the base ; more rarely a spot in the middle of the inner margin ; also, very occasionally, a spot between the discoidal lunule and the base of the hindwings. In the example of ab. *lineata*, in the British Museum coll., the 2nd of these spots is united with the rare supernumerary spot 9 near the anal angle into a long streak. The discoidal lunules of the hindwings are always less marked than those of the forewings, and are sometimes obsolescent. The relative position of spots 1, 2 and 3 on the underside of the hindwing is interesting ; sometimes 1 and 2 are under each other, at others 1, 2 and 3 are in a straight line ; this point is brought out in some of the descriptions and figures of Bergsträsser's aberrations. The absence of antemarginal spots on all the wings is one of the main features of the typical form of this species ; in various degrees of development these marginal spots may be traced, however, in individual specimens, in the earliest stages in faint grey, darkening, however, in colour, assuming even finally the form of orange lunules above the marginal spots, first near the anal angle of the hindwings, and, lastly, throughout the length of the marginal series and extending to the forewings, and all the spotting increasing in intensity until, in var. *persica*, the full Plebeiid underside spotting is definitely assumed. In the British Museum coll. the mode of development of these grey antemarginal spots is well shown in several examples of both sexes ; at first merely faint interneural pale lunular shades shutting off centrally a piece of the ground colour, secondly the darkening of this portion of ground colour, thus contrasting with the light margin, and so on till a noticeable series of marginal spots can be traced ; this development begins on the hindwings near the anal angle, and extends only rarely to the forewings in the examples of the plain, becoming commoner in Bosnia, Bulgaria and Greece, where the dark grey kernels commence at the anal angle of the hindwings to take on a definite orange form, and so leading up to the well-developed underside of var. *persica*. Becher (*Ent.*) states that the ♀s at Carlsbad, sometimes show faint traces of a row of spots along the hind margin of the hindwings. Meyer-Dür notices (*Schmett. Schweiz*, p. 90) that in var. *montana* there are sometimes weak traces of dark lunules. Blachier says (*in litt.*) that, in the examples in his collection, he finds sometimes as many as five or six obscure grey spots on the margin of the hindwing, whilst some of the grey spots are surmounted with slightly-marked white spots (as in two ♂s from Versoix and Mont Salève) ; sometimes, on the contrary, there is a series of white spots between the grey spots and the fringe (♂ from Martigny), whilst there may be a white edging both above and below the grey spots (♂ from Mont Salève). Reverdin states (*in litt.*) that, in many specimens of both sexes in his collection, there are faint indications of marginal spots, but that these are sometimes more marked and quite visible to the naked eye (eleven ♂s and four ♀s), and these interneural spots appear as almost rounded, those nearest the anal angle more distinct, sometimes the only ones that are so, whilst, in rare examples, they occupy the whole margin, except just in front; one ♂ is noted with seven on the hindwings very marked (from Arolla); the colour of these spots is rather warmer and browner than the ground-colour. This form, with grey spots indicated, we call ab. *initia*, n. ab. In three examples (♂ Simplon, ♀ Fionnay, ♀ Binn) in Blachier's collection, the spots situated at the anal angle in cells 1 and 2 are not grey, but dark reddish-brown shaded with burnt sienna; the ♂ has a third small spot of this colour in cell 3. This form, that seems to suggest an indication in the direction of the Orient forms, we call ab. *brunnescens*, n. ab. Rühl speaks (*Pal. Gross.-Schmett.*, p. 297) of black-brown spots. Kroulikowsky says (*Soc. Ent.*, vii., p. 163) that, in the Govt. of Wiatka, one sometimes meets examples with traces of fulvous spots on the underside of the wings; one suspects that these are like those mentioned by Blachier; as also are the examples, ♂ and ♀, recorded by Hering as sometimes being found with a weak trace of red spots on the underside of the hindwings at Damm and Schrey, Pomerania, in the Berlin district (Bartel and Herz). The development of the orange lunules on the underside is most interesting. The earliest to appear are the two nearest the anal angle on the hindwing, and, in this form, it occurs aberrationally in var. *balcanica*, var. *bellis*, var. *mesopotamica*, and var. *intermedia*, normally in var. *persica*, but rarely extending in these forms beyond the hindwing. It becomes much more definitely marked in var. *helena* and var. *antiochena*, extending sometimes strongly in these to the fore- as well as the hindwings, but never, apparently, so strikingly developed on the under- as on the upperside. In 1779, Bergsträsser (*Nom.*, vols. ii. and iii.) described the following aberrational forms of this species:—

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* The first measurement is from apex to apex of the wing of the set insect; the second measurement from the apex of the wing to mid-thorax × 2.

a. ab. *byzas*, Bergstr., "Nom.," ii., p. 79, pl. xlviii., figs. 5-6 (1779).—*P.P.R.* alis rotundatis integerrimis cœruleis primoribus in disco, posticis a margine nigro virgulatis; subtus ocellorum fascia solitaria. The wings uniform blue, except that, in the centre of the forewings, there is a black median spot, and, in the hindwings, a marginal series of black interneural spots; the underside with a single arcuated row of spots. I was almost inclined to consider this butterfly the "Astragalus" butterfly of the Vienna entomologists; however, as their *damoetas*[*] is said to be the same as Geoffroy's *demiargus*, and also the same as Rösel's vol. iii., pl. xxxvii., figs. 3-4, it is necessary to thoroughly differentiate our own insect, which has, on the underside of the forewing, 5 ocellated spots in an arcuate row, and behind these, somewhat exteriorly towards the lower margin, two smaller ones, one above the other; on the hindwings, but towards the centre, and towards the base, is a black reniform spot which is absent in Rösel's figures. It is highly probable that *byze* is the ♀ of this species (Bergsträsser).

The essential characters of Bergsträsser's *byzas* appear to be the wide marginal band and distinct discoidal lunule on the upperside of the forewings, the interneural marginal spots on the hindwings; the large well-marked ocellated spots and dark ground colour of the underside. The figure, ♂, is highly-coloured, the forewings with a conspicuous black discoidal lunule, dark nervures, and rather wide outer marginal band; the hindwings with a row of five black interneural dots on the outer margin; the fringes white (continued along the inner margin of the forewings); the underside grey (no blue at base), the discoidal spots large and strongly margined with white; the single transverse row of spots on the forewings, 8 in number, large, and strongly edged with white; on the hindwings the spots similarly well-developed, also 8 in number, the white margins touching each other (as in the forewings) except the two costal spots; the hindwing has also a costal spot towards the base.

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[*] It may be here noted that *damoetas*, S.V.=*cyllarus*, Linn., that *demiargus*, Geoff.=*semiargus*, v. Rott., whilst Rösel's vol. iii., pl. xxxvii., fig. 3= ? *bellargus* or *icarus*, and fig. 4=*semiargus*, v. Rott.

β. ab. *byze*, Bergstr., "Nom.," ii., p. 79, pl. xlviii., figs, 7-8 (1779).– *P.P.R.* alis rotundatis integerrimis fuscis fimbria alba; subtus cinerascentibus, fascia ocellorum solitaria. Wings, uniform brown above, beneath bluish-ash, and with a single arcuate row of ocellated spots. The preceding insect (*byzas*) is possibly the ♂ of *byze* (Bergsträsser).

The chief characters of this form are the blue tinge at the base of the upperside of the wings, and the large ocellated spots on the underside. Bergsträsser's figure of *byze* represents the ♀ form of *semiargus*, fuscous in colour, with darker nervures, and tinged with blue at the bases of the wings on the upperside; the underside grey, the ocellated spots very large. The figure shows the outer margin of the hindwings over-hollowed, making it somewhat concave; the underside grey tinged with bluish at base of hindwings, the transverse row of ocellated spots strongly developed in both wings, and consisting of seven large white-margined spots in forewing, and eight in hindwing, almost, or quite touching one another; the discoidal lunules similarly large and white-ringed (no extra spot towards the base of hindwings on costa as in the figure of *byzas*).

γ. ab. *argopoeus*, Bergstr., "Nom.," iii., p. 8, pl. lii., figs. 7-8 (1779).—*P.P.R.* alis angulatis integerrimis cœruleis fimbria alba, subtus cinereis fuscescentibus, ordine ocellorum arcuato unico inque posticarum disco macula ocellari lunata. With angled unicolorous blue wings and white fringes; beneath, bluish-grey, with a single arcuated row of small ocellated spots; in the centre of the hindwing, a discoidal lunular ocellated spot. Perhaps nothing more than an aberration of the "Astragalus" butterfly, which we shall later describe. Beneath, in the centre of the hindwings, is a lunular black white-margined spot as in the Vienna *damoetas*. With *byzas* (*Nom.*, pl. xlviii., figs. 5-6), it is, when the two insects are carefully examined and compared side by side, not easily to be confounded (Bergsträsser).

The particular features of this insect are the absence of the discoidal lunule on the upperside of forewing, and the reduction of the ocellated spots in the submedian row of the underside of forewings to five. The upperside of the fig. 7 is of a somewhat uniform purplish-blue without discoidal spots, but with a fairly wide black marginal border to all the wings, dark nervures, and chequered fringes (though Bergsträsser's description particularly notes them as "white"). The underside grey, the bases of the hindwings blue only as far as the inmost spot, and narrowly along the inner margin; the discoidal spots of fore- and hindwings white-edged; the transverse row of white-margined spots on the forewings, five in number, on the hindwings eight, with one more on costa above the discoidal, and another much nearer the base.

δ. ab. *argopoei*, Bergstr., "Nom.," iii., p. 19, pl. lxi., figs. 5-6 (1779). *Paucipuncta*, Gill., "Int. Ent. Zeits.," ii., p. 313 (1909).—♀. The ♀ of *argopoeus*, which is figured in pl. lii., figs. 7-8; both insects being here figured for the first time. It is separated from its congeners by the dark brown colour of the upperside, whilst beneath, on the forewings, there is one small ocellated spot more than in the ♂, and the spots have in the whole line a different situation; on the other hand the ♂ has on the underside of the hindwings some additional ocellated spots (Bergsträsser).

This is a fuscous ♀ without any marks whatever on the upperside except the darker nervures; no discoidal lunule. The chief character rests in the underside, the number of spots in the submedian row on the forewings being reduced to five, and on the hindwing six, the twin-spot being absent on each wing. The hindwing has, in addition, the costal basal spot. Gillmer appears to describe this form as *paucipuncta*, "in which some of the ocellated spots are inclined to disappear."

ε. ab. *damoetas*,* Bergstr., "Sys.," dec. i., pl. x., figs. 5-6 (1779); "Nom.," iii., p. 14, pl. lvii., figs. 5-6 (1779). — This insect is differentiated, as the Vienna naturalists say, by the smaller number of ocellated spots in the regular curved row of the underside, which also approaches closely the inner margin. As it thus has this feature in common with our *argopoeus*, this is also either an "Astragalus" (milk-vetch) butterfly, or it is separated therefrom only by the semilunar (discoidal) spot of the hindwings. It is true that the shape of the wings is also different in them, those of the "Astragalus" butterfly being rounded, those of *argopoeus* angled. In the *Systema* we described it as "*Damoetas.—P.P.R.* alis rotundatis integerrimis cœruleis, subtus ocellorum fascia solitaria ; the 'Astragalus' butterfly with rounded uniformly blue wings, with a single row of small eyespots beneath." The wings above are somewhat purple-coloured, blue above, grey beneath. The larva of this species is said by the Vienna entomologists to have been found on *Astragalus* and *Onobrychis* (Bergsträsser).

The main feature of this insect is the absence of the discoidal lunule on the underside of the hindwing, and the reduction of the submedian row of spots on the forewing to five, and the elongation of the fifth spot to touch the white ring of the discoidal. Bergsträsser's fig. 5 represents a ♂, rather pale blue in tint, narrow black marginal border, without discoidal lunules on the upperside of the wings. The underside is certainly that of *C. semiargus*, pale fawn in tint, with the row of spots on the forewings ending with the fifth, which is somewhat elongated ; the first and second spots of the transverse row on the hindwings are placed under each other, and not obliquely as in *byzenus*.

ζ. ab. *byzenus*, Bergstr., "Nom.," iii., p. 14, pl. lvii., figs. 1-2 (1779).—*Argiolus*, Esp., "Schmett. Eur.," i., pl. xxi., fig. 1*a* (1777); p. 277 (1779).—*P.P.R.* alis supra cœruleis immaculatis, subtus pallide fuscis, solitario in utrisque sed irregulari ocellorum dispersorum arcu. Wings blue, unspotted, above; beneath pale brownish, on all wings an irregular arcuate row of separate ocellated spots. Esper calls this butterfly *argiolus* ; as, however, it is certain that Linné's description does not agree with this insect, and as the true *argiolus* is the species we have already described under this name, no one will be surprised that we have not retained this name for Esper's insect. We have selected *byzenus* for its name because, of all our many-eyed butterflies, the most like it is *byzas* figured on pl. xlviii of the *Nomenclatur* (Bergsträsser).

Bergsträsser's insect is a rather large male of bright colour with well-defined, but not broad, black margin, and without discoidal spots on upperside. The underside, grey, with blue-tinged base, is characterised by the absence of the discoidal lunule on the hindwing, spots 1, 2 and 3 on hindwing in oblique line and 2 not under 1, and a series of pale marginal triangles or V's on the outer margin of forewing. This is the only feature in which Bergsträsser's figure resembles Esper's (to which it is referred) ; we have observed the V-like formation in one or two specimens in the British Museum coll. It appears to be caused by the light falling on a peculiar fold, and not to any line or any definite marking. Although Esper's figure is so bad, his description is quite good (*Schmett. Eur.*, i., p. 277) : "The upperside of all the wings blue (entirely without spots), but traversed by black nervures, and bordered by a similarly-coloured margin and white fringe. The underside has a discoidal lunule on each wing, seven ocellated spots on the forewings, and nine spots on the hindwings ; from the margin of the forewings sometimes run, in the ♂, some pointed marks." These latter are what both authors figure. Bergsträsser, as noted above, does not allow his *byzenus* a discoidal lunule on the underside of the hindwings.

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* *Damoetas*, Schiff., "Schmett. Wien.," 183, 7 = *Cyllarus*, Linn.

η. ab. *byzene*, Bergstr., "Nom.," iii., p. 14, pl. lvii., figs. 3-4 (1779). *Argiolus*, Esp. "Schmett. Eur.," i., pl. xxi., fig. 1*b*, ♀ (1777); i., p. 277 (1779).—*P.P.R.* alis fuscis, solitario subtus in utrisque sed irregulari ocellorum dispersorum arcu. Wings brown; beneath on both wings an irregular arcuated row of scattered small ocellated spots. The ♀ of the former. Both are copied from Esper (Bergsträsser).

The peculiar characters of *byzene* are the basal, narrowly-oval, bluish-grey* mark on the upperside of the hindwings, and the dark ground-colour of the underside; the markings are normal. Esper's figure referred to is exceedingly bad, over-coloured even more than the ♂, quite unlike anything that occurs in the species. His description, "the wings entirely dark brown without markings and with white fringes, the underside as in the ♂," is true enough of the species, but does not apply to the figure.

UNDERSIDE ABERRATIONS.

α. ab. *aetnaea*, Zell., "Isis," p. 148 (1847) Rühl, "Pal. Gross-Schmett.," i., p. 298 (1895); Tutt, "Brit. Butts.," p. 155 (1896); Wheeler, "Butts. Switz.," p. 25 (1903); Lamb., "Cat. Lep. Belg.," p. 428 (1907). *Crassipuncta*, Gillm., "Int. Ent. Zeits. Guben," ii., pp. 312-13 (1909).—Amongst several specimens of *Polyommatus alexis* which were flying in the forest regions of Mt. Ætna on June 30th, I caught, amongst others, a poor ♀ of *acis*, which shows such peculiar characteristics that I very much regret I did not search for more, for I am almost inclined to regard it as a distinct species. The forewings are a trifle narrower and more pointed than in the type; the underside is light brown without any mixture of grey; in the forewings the discoidal is not a fine line but a small reniform spot; the ocellated spots forming the submedian row are of equal size on all the wings, larger than in *acis* with a sharper white margin, but a much more important character is that, in both wings, this submedian row is nearer the outer margin than the discal lunule, whereas in *acis* the opposite is the case; on the hindwings the second ocellus from the costa, stands much nearer the third than is usual, and the first three form a straight line, whereas, in *acis*, the smaller second eyespot is always placed inwards. The fringes and coloration of the base of the hindwings not different (Zeller).

Zeller's typical specimen of *aetnaea* is a ♀ in poor condition, consequently of rather poor colour on the upperside, with a slight narrowing of the wings, but not more so than specimens in the British Museum coll. from many other places, *e.g.*, Granada, Lac d'Oo, Vienna, etc., but with the spots on the underside exceptionally well-developed, but even then not more so than aberrations from Granada, Börnich, Bergün, Bulgaria, Bosnia, etc., indeed, this seems to be a very usual form of variation in most localities. The underside coloration, too, is quite typical of its sex. The specimen really carries no special characters beyond these, and one is surprised at Zeller giving it a local name. Calberla notes it from Meddia and Moglia.

β. ab. *caeca*, Fuchs, "Stett. Ent. Ztg.," p. 253 (1883); Rühl, "Pal. Gross-Schmett.," i., pp. 298, **767** (1895); Tutt, "Brit. Butts.," p. 165 (1896); Wheel., "Butts. Switz.," p. 25 (1905); Krod., "Zeits. für Ent.," ix., p. 52 (1904). *Coeca*, Kroul., "Soc. Ent.," vii., p. 172 (1908); "Iris," xxi., pp. 202 *et seq.* (1908); Lamb., "Cat. Lep. Belg.," p. 428 (1907).—Hindwings beneath without ocellated spots; forewings with only one. This one is that which, in normal specimens, is directly over the double spot near the inner margin; it is indicated by a faint bent mark turned towards the base. This particular specimen happens also to be exceptionally large, much larger than is usual in local *semiargus*, the latter character, however, being shared with Bergün examples, from which, however, again it differs in having a narrow marginal black border to all the wings. The essential character of *caeca* is, therefore, the almost complete absence of the ocellated spots on the underside of all the wings. The specimen was taken at Eperies by Dahlström, who found it in a damp meadow with typical *semiargus*. Whether this aberration has a wider range has yet to be determined; it has not yet been found with us, but *semiargus*, although spread all over the Taunus, is rather scarce, occurring locally in two broods (Fuchs).

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* This varies in different copies of the work, some having this mark bluish-grey, others quite bright blue.

This is a form with most of the spots in the submedian row of both fore- and hindwings wanting. Kroulikowsky notes (*Soc. Ent.*, vii., p. 163) the capture of a ♂ of the ab. *caeca* near Sarapoul, in the Govt. of Wiatka, in 1880. He further notes (*Iris*, xxi., pp. 202 *et seq.*) two examples captured at Kasan, and one at Mariinsky-Possad. Krodel writes (*Zeits. für Ent.*, ix., p. 52) that ab. *caeca*, Fuchs, is a transition form to *spadae*, Hellw., with only one ocellated spot in the central row on the underside of the forewings; he adds that he received a ♂ of *semiargus* belonging to this intermediate form, with two rudimentary little eyespots on each hindwing captured on July 19th, 1901, on the Albula Pass between Preda and Weissenstein. A fine large ♀, in the British Museum coll., without data, only fails in being ab. *spadae*, by having spot 4 on the hindwings developed; in this specimen the discoidal spots on the hindwings are somewhat obsolescent; many other examples are wanting in two or three spots on the forewing and three or four on the hindwing (see *anteà* pp. 261-2, 264).

γ. ab. *spadae*, Hellweger, "Ent. Zeits. Guben," x., p. 67 (1896); Krod., "Ill. Zeits. für Ent.," ix., p. 52 (1904). *Caeca*, Gillm., "Int. Ent. Zeits. Gub.," ii., pp. 312-3 (1909).—Two ♂s captured in the limestone mountains north of Innsbruck, at 1100m. elevation, mid-July, 1895. The special feature of this aberration is the entire absence of all the ocelli on the underside of all the wings, the discoidal lunules only remaining. On the forewings, the discoidal spot has the normal form of a short, black, white-edged, transverse line (repeated as a black line on the upperside); on the hindwing, the discoidal spot is much reduced, has lost the usual cordiform outline, and consists merely of a fine, straight, little stroke, with a broad, white margin on the left hindwing, whilst, on the right hindwing, the black kernel has been absorbed by the white edging. In colour and its other markings it corresponds with the type (Hellweger).

Hence it appears that ab. *spadae* is nearest to ab. *caeca*, Fuchs, but goes a step further. It is, indeed, the extreme form of obsolescence in the species, *caeca* only forming a transition to *spadae*. A first-class specimen of ab. *spadae* is in the British Museum coll., but is without data; it is a rather small ♂, absolutely without markings on the underside except the discoidals. We have a similar ♂, identical in its markings, captured at Simplon, July 29th, 1899. Gillmer says (*Int. Ent. Zeits.*, ii., p. 313), that the form in which the spots have entirely disappeared is rare, and chiefly occurs in the ♂.

δ. ab. *striata*, Wheeler, "Butts. Switz.," p. 25 (1903). *Semiargus* ab., Courv., "Mitt. Schweiz. Ent. Ges.," xi., p. 19 (1903); ? Aigner-Abafi, "Ann. Mus. Nat. Hung.," p. 517 (1906). *Elongata*, Gillm., "Int. Ent. Zeit. Guben," ii., pp. 312-313 (1909).—Specimens in which some of the spots of the underside are extended into streaks (Wheeler).

This is the form in which only some of the spots are elongated into streaks. Wheeler recorded this form as occurring, to his knowledge, only in the ♀. Courvoisier (probably on the strength of Wheeler's record) notes under his "Formæ elongatæ," also only in the ♀, "specimens with the ocellated spots in the submedian row enlarged; commoner in the forewings than in the hindwings, but sometimes in all the wings" (*Mitt. Schw. Ent. Ges.*, xi., p. 19); similarly, Gillmer, under the name of *elongata*, notes specimens as occurring, especially in the ♀, "with an elongation of the spots in the fore- and hindwings or only in the forewings." Aigner-Abafi says that there is a ♂ in the "Treitschke coll.," 30mm. in expanse, some of the spots on the underside of the forewings of which are very much elongated. Wheeler informs us (*in litt.*) that the spots of the forewings have been those especially affected in the specimens he has seen. Specimens in which some of the spots are elongated in this manner are rather rare.

ε. ab. *lineata*, n. ab.—A specimen quite extreme in the development of the spots is in the British Museum coll. It is far in advance of any of the forms described above under the name *striata*, in which "some of the spots" are extended into streaks, for this has practically all the spots developed into thick bars on both fore- and hindwings. The discoidals are normal, so is the costo-basal spot of the hindwings, but spots 1, 2, 3, 4 and 5 of the forewings are thick cuneate strokes, some 3-4mm. in length, whilst 6 and 7 are almost normal. On the hindwings, spots 1, 2, 3, 4, 5 and 6 are as strongly developed (1, 2 and 6 particularly so), 7 and 8 much larger than usual, whilst a supernumerary 9 runs as a thick stroke halfway the length of the inner margin. The example is a ♂, without data.

Krodel has sent us a photograph of a very similar specimen taken at Nürnberg. The streaks in this specimen extend from 2mm.-5mm., and every spot except 6 and 7 on the forewing is much lengthened as in the type example in the British Museum coll.. See also *anteà* pp. 260-261.

LOCAL RACES.

a. var. *cimon*, Lewin, "Ins. Gt. Brit.," i., p. 80, pl. xxxviii., figs. 6-7 (1795). *Cymon*, Haw., "Lep. Brit.," p. 48 (1803); Sam., "Ent. Usef. Comp.," pp. 242, 381, 417 (1819); Conway, "Loudon's Mag.," vi., p. 96 (1833); Bree, "Loudon's Mag.," vi., p. 190 (1833). *Acis*, Stphs., "Illus. Haust.," i., p. 86 (1828); Humph. and Westd., "Brit. Butts.," p. 202 (1841); Wallgrn., "Skand. Dagf.," p. 238 (1853); Stn., "Man.," i., p. 58 (1857); Dale, "Hist. Brit. Butts.," p. 56 (1890); Barr., "Lep Brit. Isl.," i., p. 94, pl. xiv., figs. 2-2*b* (1893). *Semiargus*, Lampa, "Ent. Tids.," vi., p. 5 (1885); Auriv., "Nord Fjär.," p. 15 (1888); Tutt, "Brit. Butts.," p. 164 (1896). *Angustimargo*, Gillm., "Int. Ent. Zeits.," ii., p. 313 (1909).—The dark blue.—This is a very rare butterfly with us, and, as may be supposed, our knowledge of its natural history is very confined. The caterpillar is unknown. The last week in August, 1793, I took two or three of the butterflies, flying in a pasture field at the bottom of a hill near Bath. They were much wasted in colour, and appeared to have been long on the wing, so that it may be concluded that they were first out from the chrysalides about the middle of July. The upperside is represented at fig. 7, the underside at fig. 6 (Lewin).

The characteristic of Lewin's *cimon* is the very narrow marginal border to the upperside of the wings. The ground-colour is purple-blue, the spots on the underside rather small, the bases of the wings blue scaled. The British examples appear to be absolutely identical with specimens from Scandinavia and St. Petersburg, and the narrow-bordered specimens from Germany, *e.g.*, Anhalt, etc. The underside appears to be very uniformly grey in its ground-colour, and a faint suspicion of brown in that of the ♀. It is one of the brightest-tinted, narrow-margined forms that we have seen, and is apparently characteristic of northern and western Europe. The second-broods from Savoy, etc., are very similar. The ♀ s appear to have the fringes tending to dark grey rather than white in the British specimens examined.

β. ab. *coelestina*, Mill., "Petit. Nouv. Ent.," no. 64, p. 256 (1872); "Iconog.," p. 440, pl. 154, fig. 3 (1874). *Cyllarus* var., Staud., "Cat.," 3rd ed., p. 89 (1901).—In speaking of the entomological riches of the Val Lantosque, I have already mentioned in *Les Petites Nouvelles Ent.*, no. 64, the presence, in the Alpes-Maritimes, of that Lycænid of Southern Russia, discovered in 1843 by Eversmann. Although both sexes of the species have been figured, I consider it necessary to give a representation of ♂ *coelestina* in my *Iconographie*, as it is practically a novelty to most entomologists. I trust by doing this to call the attention of lepidopterists to this beautiful Lycænid, which ought to occur in Switzerland, and still more so, in the Pyrenees, where it might be confounded with its allies, *L. cyllarus* or *L. acis*. The ♂ is of a violaceous-blue above, and of a mouse-grey beneath, tinted with iris-blue at the base of the hindwings. The ♀ is entirely black above, with the fringe white, without the iris-blue that characterises the underside of the hindwings of the ♂. This insect does not appear to be rare in July, below St. Martin, on the banks of the principal affluent of the Vésubie, the Borréon. It is probable that the insect may be found in other elevated places in the Alps of our department. A few weeks before my arrival at St. Martin, the species had already been discovered by Mr. Rod. Zeller, who at first did not recognise it (Millière).

The *coelestina* of the Alpes-Maritimes, as figured by Millière, is without doubt *semiargus* of a deep violet-blue, with a well-defined, black marginal border and discoidal lunules. The underside is, indeed, quite typical, except that the forewings have five well-marked, white-ringed, dots and the double one (very small and obsolete), and six well-marked ones, with again the double one small, on the hindwings, the discoidal on the underside of fore- and hindwings well-marked, but fine; the bases of the hindwing blue. It appears to agree very well indeed with specimens from Bergün, Ticino, Courmayeur, etc., in our collection. Indeed, one suspects it to be just the ordinary form of the hot southern valleys of the Alps of Central Europe and southern France, although some of those from the lower alpine valleys of those parts of Savoy and the Hautes-Alpes abutting on the lowlands of France, are narrow-bordered and more like the var. *cimon*, Lewin.

γ. var. *montana*, Meyer-Dür, "Schmett. Schweiz," p. 90 (1851); Frey, "Lep. Schweiz," p. 21 (1880); Lang, "Butts. Eur.," p. 130 (1884); Kane, "Eur. Butts.," p. 50 (1885); Rühl, "Pal. Gross.-Schmett.," pp. 298, 767 (1895); Tutt, "Brit. Butts.," p. 164 (1896); Staud., "Cat.," 3rd ed., p. 89 (1901); Wheeler, "Ent. Rec.," xiii. pp. 120-121 (1901); "Butts. Switz.," p. 25 (1903); "Ent. Rec.," xvii., p. 199 (1905).—With the increase of elevation, on the other hand, *acis* becomes smaller; even in the mountain-region in the meadows around Meiringen (2500ft. above sea-level) it flies about June 13th-15th in countless numbers, in general not larger than *optilete*; at considerable heights of 4000ft. to 5000ft. above sea-level, in the subalpine region, *e.g.*, in the Œschinenthal, the forewings of this small form assume a narrower, more pointed, form (mid-July), until at last, in the still higher alpine region, at 6400ft., as at Schwarrenbach on the Gemmi, the butterfly, August 11th, attains only the size of *aegon*. This var. *montana* differs also somewhat on the underside in two directions. The greyish tone runs more into brownish and the eye-spots are larger and more sharply bordered with white. In the anal angle of the hindwings in a male from the Grimsel faint traces of darker marginal lunules appear. This example, as well as those from Schwarrenbach, agrees in shape, size and arrangement of eye-spots on the underside so exactly with a butterfly taken by Frivaldsky, in the Balkans, and sent to me as *Pap. bellis*, that I observe no other difference than that in this *Pap. bellis* those traces of darker marginal lunules on the underside of the hindwings have developed into reddish-yellow spots. Freyer figures (*Neu. Beit.*, v., pl. 398, fig. 12) this *bellis* in both sexes; though the male is, according to my specimen, much too large, the forewings too rounded, the blue ground colour much too bright, and the black border too narrow. In respect of the brownish marginal lunules of the underside, he says, that they are not visible in every example. In this case, therefore, the questionable *P. bellis* may turn out to be nothing more than a southern modification of our var. *montana* of *acis*. *P. acis* (Freyer, *Neu. Beit.*, pl. 451, fig. 4) is good and represents one of the low level region (Meyer-Dür).

The var. *montana*, as a race, is a doubtful quantity, and Meyer-Dür's general statement that "the higher the habitat, the smaller the butterfly," must be accepted with caution. It may be true that, compared with the largest examples of the plains of Central Europe, often measuring 32mm.-35mm., those of the mountains generally are smaller, though, in the Laquinthal and various parts of Ticino, up to 5000 ft., the specimens often measure 30mm., and an example from

Meiringen, in the British Museum coll. is quite this size, although Meiringen examples are specially noted by Meyer-Dür (*suprà*) as being "not larger than *optilete*." It is really, as a rule, not until one gets well above 5000 ft., that the var. *montana*, as such, occurs. Then the comparison with *Plebeius argus* (*aegon*) might hold, if fair-sized "plain" forms of *P. argus* were used for the comparison. These high alpine forms are, as Staudinger notes (*Cat.*, 3rd ed., p. 89), "minor, latius nigromarginata," and the diagnosis appears perfectly true of real high-alpine specimens, Höfner noting that the most extreme examples from the Vorderberg Moss and the Sau-Alpe in Carinthia, have the marginal border extending to the middle of the wing. In our own collection we have specimens that might be referred here, taken by ourselves at le Lautaret (7000 ft.), the Val Véni (6500 ft.), Dischma-Thal (6000 ft.), Arolla (7000 ft.); also from Lölling, Kor Alpe, Sau Alpe (Chapman). Frey says (*Lep. Schweiz*, p. 21) that high alpine specimens are remarkably small, whilst Lang states that the name refers to "the small specimens taken in the higher alps, and which do not differ from the type except in their smaller size," but one doubts whether any high alpine specimens merely vary in this way, the type being brighter coloured, and much less suffused than those from the highest alps. Frey notes it as occurring from 6000 ft.-7000 ft., at Zermatt, the Lower-Engadine and the Stelvio. Wheeler gives its measurements as 25mm.-27mm. and adds "with darker ground colour," and notes it from "the Blumenthal, above Mürren, top of Simplon Pass (Wheeler), Gornergrat, Great St. Bernard (Favre), Dischmathal, Roseg Glacier (Fison)." Bath mentions it from Kandersteg, Gemmi Pass, St. Niklaus, Zermatt, Zmutt-Thal, and the Riffel-Alp.

ASIATIC RACES.

α. var. ***uralensis***, n. var.—♂, 33mm.-37mm., ♀, 36mm.-38mm. A fine large race; the ♂s dark purplish-blue, with a well-developed blackish marginal border on all wings; suffused nervures, distinct discoidal, and white fringes. The ♀s uniform dark brownish-fuscous; fringes grey. Underside ♂ grey, ♀ brownish-grey; spotting as in European type, but often reduced in number and size. Captured Miashk, June, 1900, by Grum-Grshimailo (British Museum coll.).

This race is very like var. *altaiana*, but the ♂s are somewhat darker in tint, and the ♀s tend to be rather larger than the ♂s. Like *altaiana*, there is a tendency for the spots on the underside to be sometimes reduced in number and size.

β. var. *altaiana*, n. var. 30mm.-36mm. ♂ of a somewhat bright, but still deep, purple-blue, with broad, dark, hind-marginal border to fore- and hindwings; discoidal lunules well-defined; nervures suffused; fringes white. ♀ unicolorous brownish-fuscous, fringes grey. Underside ♂ dark grey, ♀ brownish-grey; discoidal lunules well-defined in forewings, ill-defined in hindwings; submedian row of spots inclined to be small, 6 and 7 of forewings often absent.

Of this Central Asiatic form, there are, in the British Museum coll., several examples very similar in general appearance; they are of fairly large size, but smaller than var. *amurensis* and var. *uralensis*. It is on the upperside somewhat like *balcanica* in general appearance, but is much more purple-blue than the European race, and the obsoletely-marked underside is very different. The examples noted are—(1) two ♂s, one ♀, "Changai mountains, 1899 (Leder)," the ♀ slightly smaller than the ♂s; (2) one ♂, "Ongodai, Altai mountains, 1898 (Berezowsky)," one ♀, "Ongodai, 3000ft-5000ft., 28. vii. '98 (Jacobson)," entirely fuscous and rather smaller than ♂. (3) one ♂ and one ♀, "Arasai, Altai mountains, 6000ft., 1900 (Leder)," the ♀ entirely fuscous, same size as ♂; (4) one ♂, "Sary Ob, Sarafshan, 7000ft.-9000ft., 1900 (Funke)," rather small (30mm.); (5) one ♂, "Tian-chan—Yir Madaus, 7. vi. '89 (Grum-Grshimailo)," near the last, rather bluer, and slightly narrower border; (6) one ♂, "Lajran, Chingob-d., Daiwas (Grum-Grshimailo)," one ♂ "Tobi-Alai-d., Chingob-d., Daiwas (Grum-Grshimailo)." These two examples have a label "*ussuria*, Gr.-Gr., MSS." We are not able to trace the name, nor connection between the specimens and the place (Ussuri) apparently indicated.

γ. var. *amurensis*, n. var. *Semiargus* var., Staud., "Rom. Mém.," vi., p. 163 (1892); Herz, "Rom. Mém.," xi., p. 238 (1898).—Very large in size, 36mm.-38mm. ♂ of good colour, somewhat variable in width of border; the nervures suffused, discoidal lunule clearly defined, fringes white. ♀ uniformly fuscous, fringes white, costal border of forewings also narrowly white. Undersides typically marked, with fairly large (♀ very large) white-ringed spots. Amur—Blagovetschensk, Sutschan.

There are in British Museum coll., only three Amurland specimens. These are—(1) ♂, labelled "Blag: Amur (Leech coll.);" (2) ♂, "Amur. Std., '80 (Elwes coll.);" (3) ♀, "Sutschan, east Asia (Dörries)." The Blagovestchensk ♂ is large, with narrow border, the other almost exactly similar, but with a wider border. The ♀ is a very remarkable specimen. It is unicolorous, of a dark fuscous tint, with almost snow-white fringes, and a narrow white costa to the forewings; the latter are very rounded, and give it a very special appearance; the underside has exceptionally large spots. Chapman has also two Blagovestchensk ♂s from the "Lang coll.," both with narrow border, and of quite a bluish-mauve tint. Staudinger says of this form: "According to Ménétriès, Schrenck found this insect near Borbi, Christoph took it near Raddefka, Dörries sent it from Askold, and Graeser found it rather rarely near Chabarowka and Pokrofka. My Amurland examples are generally very large, otherwise they agree almost exactly with European specimens." Herz observes ("Lep. from Lena and N. Siberia," *Rom. Mém.*, xi., p. 238) that "specimens were taken from July 13th-30th, at Witim and Wilni; the upperside of the ♂s rather brighter blue than specimens" before him "from the Ural, Caucasus, Thian-Shan, and Mongolia. The underside of both sexes also exhibits a far brighter coloration, and comes, in this respect, near *parnassia*, Stdgr., only that the blue tinge on the underside is not so strongly expressed."

δ. var. *fergana*, n. var.—30mm.-36mm. Almost the same size as var. *altaiana*. ♂ slightly brighter in ground colour than of that variety, discoidal lunule obsolete, nervures hardly suffused; dark marginal borders very narrow; fringes white. ♀ of same size as ♂, entirely fuscous, with grey or greyish-white fringes. The underside grey in ♂, brown-grey in ♀; the spots typical in arrangement, rather small in size, 6 and 7 of forewings tending to obsolescence. Namangan, Bashkaus, etc.

This is a bright-coloured, narrow-bordered race (whether seasonal or geographical there are not enough data to show). In the British Museum coll., there are—(1) ♂, labelled "Namangan, central Asia, ex Staud."; (2) ♂ and ♀, "Alarsk. fl. Jret, 1894 (Kaschkaroff)," the ♂ very blue, narrow-bordered like the Namangan specimen; the ♀ large, fuscous; (3) ♂ and ♀, "South-east Altai, Bashkaus, 3000ft.-6000ft.," the ♂ "30. vii. '98," the ♀, "26. vii. '98," the ♂ of good colour, but with narrow border, the ♀ fuscous, and of the same size as the ♂. [(4) ♂. "Thian-Schan Or. (Gr.-Gr.)," like the Namangan specimen with regard to its border, but larger, bluer in colour; the underside with pale marginal lunules on the hindwings (the only central Asiatic specimen in which this appears to be noticeable in the British Museum coll.).]

THE RACES OF THE ORIENT.

This species undergoes its greatest modification in the countries of south-eastern Europe and south-western Asia, *i.e.*, in the Balkan Peninsula, Asia Minor, Armenia, Transcaucasia, north Persia, and Syria, the most extreme forms being developed in Morea, its most southern locality in Europe, and the Lebanon, its most southern locality on the mainland of Asia. The extreme variation is in three distinct directions, *viz.*, smaller size, development of orange in the submarginal areas of all the wings, and development of the well-known marginal lunular spots on the underside of all the wings. These three characters more or less combined, lead to a series of most beautiful local races known as *balcanica*, n. var., *bellis*, Frr. (*parnassia*, Staud.), *helena*, Staud., *antiochena*, Led., *mesopotamica*, n. var., *intermedia*, n. var., and *persica*, n. var. These have been so mixed up, and the names so misused by Staudinger and more recent collectors in these districts, that nothing but the excellent series of specimens, including co-types of many of them, in the British Museum coll., has enabled us to work out the details concerning each. Our descriptions will show the main features of the races and their distribution.

a. var. *balcanica*, n. var. *Parnassus*, Nich., "Ent. Rec.," xii., pp. 32, 69 (1900). *Semiargus*, Caradja, "Iris," viii., p. 40 (1895); Elwes, "Trans. Ent. Soc. Lond.," p. 195 (1900); Rebel, "Lep. Fn. Balk.," i., p. 193 (1903).—♂, 34mm.-38mm. ♀, 32mm.-39mm. The ♂ of a deep purple-blue colour, with broad dark marginal border; well-defined discoidal lunules and suffused nervures. ♀ of an uniform, dark, fuscous-brown. Underside in both sexes almost typical with well-defined spots, traces of two or three fulvous crescents sometimes developed near the anal angle of the hindwings. Taken in Bosnia and Bulgaria.

The specimens in the British Museum coll. show this to be a very distinct race, the largest, indeed, represented in this coll., from Europe and Asia. It has nothing in common with the vars. *bellis* (*parnassia*) and *helena*, which it much exceeds in size, width of marginal border (♂), depth of colour (in both sexes), absence of orange lunules on upperside of hindwings (♀), and other characters. The underside is essentially typical in the forewings and the hindwings also, except that it shows sometimes as an aberrational form traces of one or two (rarely more) fulvous crescents near the anal angle of the hindwing. Mrs. Nicholl records it (*Ent. Rec.*, xii., p. 32) as occurring in the Struma Valley), on June 18th, 1899, the specimens not so well-marked as at Slivno (where, according to Rebel, the specimens are of the smaller form *parnassia*). Elwes says (*Trans. Ent. Soc. Lond.*, 1900, p. 195) that "this insect was the commonest, and, indeed, the only, Lycænid at high elevations in the Rilo Dagh in 1899, where it was very common at 5000ft.-7000ft., and, perhaps, higher; most, but not all, of the specimens showing, on the hindwing below, the reddish marginal spots said to be characteristic of the var. *parnassia*, Staud., from Greece, but that is normally a small form, and all the Rilo specimens are large." Rebel's remarks (*Lep. Faun. Balk.*, i., p. 13) also clearly chiefly refer to this form. He says that "the species is not rare in West Bulgaria, even round Sofia, and becomes very common in the Rilo, where it reaches an elevation of 2000m. His statement that Elwes' specimens "of large size, with reddish marginal spots on the underside of the hindwing, might, perhaps, better be referred to *bellis*, Frr., than *parnassia*, Staud.," suggests that he quite misapprehends the difference between the somewhat smaller, brightly-coloured, narrow-margined ♂ s of *bellis*, as figured by Freyer, and the large, darker, broader-margined ♂ s of *balcanica*, as represented by Mrs. Nicholl and Elwes' specimens in the British Museum coll., whilst the large, fuscous ♀ s are still more strikingly different. He adds that Haberhauer sent numerous examples from the Rilo range, all, however, typical, and that he himself only took typical examples there. The specimens in the British Museum coll. (6 ♂ s and 6 ♀ s) are strongly racial, just as Elwes describes them, and quite different from the very many representatives of the species in the collection from all other European and Asiatic countries. Mathew observes (*in litt.*) that "the specimens from Gallipoli differ considerably from those of other parts of Europe, being larger, the ocellated spots on the underside also larger, whilst they have also two or three obscure orange spots beneath, situated near the anal angle of the hindwings." This description reads like *balcanica*, and the examples may have to be referred here, but they may be var. *intermedia* as no diagnostic character is given. Similarly, Caradja notes (*Iris*, viii., p. 40) that the Roumanian examples are very large, 33mm.-34mm., the ♀ s extremely dark black-brown, the underside, in both cases, beautiful pearl-grey, of a somewhat lighter shade than in German specimens, whilst two ♂ s from Azuga have, at the anal angle of the hindwing, a trace of the red spots, which are found in var. *bellis*. Mann also records the examples from Tultscha, as being much larger than those found in the neighbourhood of Vienna.

β. var. *parnassia*, Staud., "Hor. Soc. Ent. Ross.," vi., p. 55, *in part* (1870); Nich., "Ent. Rec.," xii., p. 31, *in part* (1900); Rebel, "Faun. Balk.," i., p. 193, *in part* (1903). *Semiargus* var., Staud., "Stett. Ent. Ztg.," p. 265, *in part* (1862). *Semiargus*, Fountaine, "Ent. Rec.," xiv., p. 60 (1902).—Only taken on the Parnassus from April 20th-May 26th, but in very large numbers. The specimens appear to be uniformly smaller than those from Germany, and even from the Alps of Switzerland. The colour of the underside is of a slightly lighter grey, whilst, in the majority of the specimens, are found, on the underside of the hindwings at the anal angle, traces of reddish spots which, in individual cases, are quite red, and, in some ♂ s, even show through on the upper surface. One is, therefore, entitled to name this var. *parnassia*. It only differs from var. *bellis*, in size, the latter is only known to me in very large specimens (Staudinger).

Specimens of this so-called small, local race, captured by Staudinger on Mount Parnassus, and distributed by him as var. *parnassia*, now in the British Museum coll., measure, ♂ s, 28mm.-32mm., ♀ s, 29mm.-33mm. It is only small, therefore, in comparison with the larger races of this species, but, as a race, is very characteristic, and appears to be found locally in northern Greece and Turkey. The ♂ is bright in colour, with narrow marginal borders, and faint, or absent, discoidal spots on the upperside, the ♀ fuscous, with or without two or three faint orange lunules developed on the upperside of the hindwing, near the anal angle, the latter only occurring markedly in the more aberrant examples. This particular aberrant form was described and figured by Freyer, in 1843, as *bellis* (the ♂ 32mm., the ♀ 33mm. in expanse, *i.e.*, exactly the size of the larger *parnassia*, received as such from Staudinger himself, in the British Museum coll.). The underside of the forewings of both sexes is typical, but, on the hindwings, two or three faint orange lunules are sometimes developed on the hind-margin near the anal angle. In 1870, as noted above, Staudinger re-described the race as *parnassia*, stating that it only differed from Freyer's *bellis* in size (see *suprà*); but, as already noted, Freyer's *bellis*, figured also by Herrich-Schäffer and Gerhard, is of exactly the same size as some of Staudinger's examples of *parnassia*. In 1871, Staudinger (*Cat.*, 2nd ed., p. 14), without explanation, erroneously fathered the name *bellis* upon the Persian race, which bears no resemblance to Freyer's, Herrich-Schäffer's, or Gerhard's figures, nor agrees in any way with Freyer's description of *bellis*, and this erroneous application was continued in the *Cat.*, 3rd ed., p. 89. There are in the British Museum coll. ten ♂ s and five ♀ s from Mount Parnassus (mostly distributed by Staudinger himself as *parnassia*), of these two ♂ s and three ♀ s are referable to ab. *bellis*, Frr., the rest (eight ♂ s and two ♀ s) are merely typically-marked *semiargus* of this particular race, with no development of orange lunules on the upper- or underside, the specimens of *bellis* being merely interesting aberrations occurring amongst the other typically-marked specimens. Rebel states (*Lep. Fn. Balkans*, i., p. 193) that this small race is not rare at Slivno (in Kirchenwald), and that he also "captured it, at the end of June, 1896, in the Langes-Thal, the specimens agreeing quite with Greek examples, even in their small expanse, and adds that Mrs. Nicholl also took it there three years later" (*Ent. Rec.*, xii., p. 31), *viz.*, on May 29th, 1899, on the sandstone hills to the west of Slivno, and it appears to be due to these captures that Staudinger adds "East Roumelia" to his localities for *parnassia* (*Cat.*, 3rd ed., p. 89). It is quite clear, therefore, that *parnassia*, Staud., sinks to *bellis*, or, at most, can only exist as a racial name, of which its chief form is :—

γ. ab. *bellis*, Freyer, "Neuere Beit.," v., p. 26, pl. 398, figs. 1-2 (1843); H.-Sch., "Sys. Bearb.," pp. 126, 160, pl. l., figs. 232-5 (1844); Meyer-Dür, "Schmett. Schweiz," p. 90 (1851); Gerh., "Mon. Schmett.," p. 9, pl. xiv., figs. 1*a*-*c* (1853); Lang, "Butts. Eur.," p. 130 (1884). *Semiargus* var., Staud., "Stett. Ent. Ztg.," p. 265 (1862). *Parnassia*, Staud., "Hor. Soc. Ent. Ross.," vi., p. 55, *in part* (1870); "Cat.," 2nd ed., p. 14 (1871); Lang, "Butts. Eur.," p. 130 (1884); Kane, "Eur. Butts.," p. 49 (1885); Rühl, "Pal. Gross-Schmett.," i., pp. 297, 767 (1895); Tutt, "Brit. Butts.," p. 164 (1896); Staud., "Cat.," 3rd ed., p. 89 (1901); Nich., "Ent. Rec.," xii., p. 31 (1900); Rebel, "Lep. Fn. Balk.," p. 193 (1903).—If this butterfly did not show, on the underside, yellowish, rust-coloured marginal spots outside the submedian row of ocellated spots, I should consider it to be our common *Pap. acis* (*i.e.*, Hübner's *argiolus*, figs. 269-271), but these rust-yellow spots, found also in the ♀ on the inner angle of the hindwings (upperside), distinguish it from *P. acis*. The ♂ is on the upperside dark blue, with white fringes and a black marginal border; the ♀ is brown above with red-grey fringes, which shade off into white at the wing-apices; the rust-yellow spots towards the anal angle of the hindwings are not clearly defined in all specimens. The underside is grey, with a blue tinge at the base, has generally five larger, and one smaller, black, white-edged spots on the hindwings. In this respect, the butterfly resembles *P. acis* completely, but the latter does not show the rust-yellow spots on the margin. Each wing on the underside carries a white-margined, black, lunular discoidal spot. The antennæ are spotted black and white, with a small club; the abdomen is covered with white hairs, the legs white-grey. Captured in Turkey, by Weissenborn (Freyer).

This well-marked aberration of the somewhat small, bright-coloured, narrow-margined form, that appears to be locally common in certain parts of northern Greece, and various parts of Macedonia, Turkey, etc., is almost identically figured, though from different sources, by Freyer, Herrich-Schäffer and Gerhard. The originals of Freyer's figures, ♂ 32mm., ♀ 33mm., were taken in "Turkey, by Weissenborn," those of Herrich-Schäffer's, ♂ 32mm., ♀ 31mm., were received from Keferstein, who "captured them in the Balkans and near Constantinople, in May," whilst those of Gerhard's, ♂ 29mm., ♀ 31mm., were sent by Frivaldsky from "Turkey." The specimens in the British Museum coll., sent out by Staudinger as *parnassia*, vary from ♂ s 28mm.-32mm., and ♀ s 29mm.-33mm., practically the same size as those figured by these authors, which makes the last part of Staudinger's remark (*Hor. Soc. Ent. Ross.*, iv., p. 55) that "*parnassia* only differs from *bellis* in size," the latter only being known to him "in very large specimens," very inexplicable, and suggests that, instead of studying the figures and descriptions of *bellis* (as given by Freyer, Herrich-Schäffer, and Gerhard), he was satisfied with accepting specimens of a larger race as *bellis*, and possibly explains the further statement (*Stett. Ent. Ztg.*, 1862, 265) that he makes, when describing var. *helena*, where he notes that "specimens of *bellis*" before him, "which came from the Tokat Alps, were almost twice the size of those of *helena*."* A mere glance at Freyer's figures and description should have told Staudinger that Freyer was not describing the Asia Minor forms, which are entirely different in their appearance from the *bellis* of Turkey and Greece, whilst still more different are the Persian examples, which (*Cat.*, 3rd ed., p. 14) Staudinger also includes under *bellis* when he states that it inhabits "Pontus, Hyrcania, and (?) Asia Minor," *i.e.*, he has mistaken, almost from the commencement of his study of the species, our *persica* for *bellis*, although the two races bear no real resemblance to each other. Staudinger's failure to properly appreciate Freyer's description and figure has misled all authors who follow his *Catalog* in applying *bellis* to the Persian race. The true *bellis*, then, is the race in which the ♂ on the upperside is blue, with a very narrow marginal border, with scarcely a trace of the discoidal lunules of the forewing, whilst the underside is typical both in colour and spotting, except for the tendency shown to develop a series of orange lunules on the margin of the hindwing; the ♀ is dark fuscous on the upperside, with distinct orange marginal lunules, more or less faintly reproduced, on the margin of the hindwing, whilst the underside, as in the ♂, is of typical colour and spotting, with, however, the orange marginal lunules of the hindwings frequently faintly developed as in that sex.

δ. var. *intermedia*, n. var. *Bellis*, Staud., "Stett. Ent. Ztg.," p. 265 (1862); Rom., "Mém.," i., p. 53 (1884); Holtz, "Ill. Woch. für Ent.," p. 47 (1897); Nich., "Ent. Rec.," xiii., p. 209 (1901); Elwes and Nich., "Trans. Ent. Soc. Lond.," p. 94 (1901); Fountne., "Ent.," xxxvii., pp. 79, 158 (1904). *Antiochena*, Staud., "Hor. Soc. Ent. Ross.," vi., p. 55 (1870). ? *Helena*, Nich., "Ent. Rec.," xiii., pp. 172, 207 (1901).—♂ 25mm.-36mm., ♀ 28mm.-37mm. This form occurs in Asia Minor, North Syria, Transcaucasia and Hyrcania, where it trenches on the ground occupied by *persica*. It varies much in size, but averages much larger than *bellis*, Frr. (*parnassia*, Staud.), and is little, if any, less than *persica*. The ♂ is of a dark purple-blue colour, the nervures suffused, the discoidal lunules dark, the hind-marginal border wide. The ♀ is fuscous, often strongly suffused with blue over almost the whole area of the wing; the hind-margin with more or less well-developed orange lunules on the hindwing, continued occasionally on the forewing. The underside dark grey (♂), brown-grey in the ♀; the spots moderately large, with no marginal lunules to forewings, but with more or less fairly developed grey marginal lunules on hindwing containing a fulvous filling near the anal angle. Examples in the British Museum coll. come from: Asia Minor—Amasia Tokat, Taurus mountains (Lederer); N. Syria—Shar Derésy; Transcaucasia—Borjom; Hyrcania.

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* The *helena* in the British Museum coll. range—♂ s 28mm.-31mm., ♀ s 28mm.-30mm. The Asia Minor and North Syrian examples, which certainly are not *bellis*, Frr., vary from ♂ s 25mm.-36mm., ♀ s 28mm.-37mm., and are certainly larger, in the largest examples, than average *helena*, but still something short of being twice as large.

This race shows a distinct approach to var. *persica*, and considerable difference from the true *bellis*, Frr., of Greece and Turkey. The specimens are larger than the latter, the ♂s much more suffused (in this respect approaching *persica*) on the upperside; the undersides much darker grey and more strongly spotted than in any Greek examples of *bellis*, Frr. (*parnassia*, Staud.), but much less so than in var. *persica*. As in true *bellis*, there is no spotting on the margins of the undersides of the forewings, whilst the margins of the hindwings present only a series of faint grey lunules, enclosing two or three faint fulvous crescents near the anal angle. The females are very different on the upperside, for, whilst that of the true *bellis* is entirely fuscous (except for the orange lunules near the anal angle of hindwings), that of *intermedia* is as strongly tinged with blue as is that of *persica*, whilst it is much more generously supplied with orange in the more richly-marked specimens, three orange spots on the hindwings and frequently one on the forewings being present. Staudinger, in 1862, writing of this insect under the name of *bellis*, Frr., says (*Stett. Ent. Ztg.*, p. 265) that "the examples" before him "from the Tokat Alps are almost twice the size of *helena* (from Greece), the orange on the underside appearing in short widely-separated spots, which never create the impression of being band-like as in *helena*." We have already criticised (*anteà*, p. 275) this statement concerning the comparative size, *helena* averaging 28mm.-31mm., the largest *intermedia*, 36mm. ♂, and 37mm. ♀. There are in the British Museum coll. two ♂s and two ♀s without locality, but labelled "Zeller's coll., 'intermediate between *bellis* and *antiochena* (Lederer),'" which are, no doubt, some of the very examples referred to by Staudinger (*Hor. Soc. Ent. Ross.*, vi., p. 55) as caught by Lederer in 1869 in the Taurus mountains. They are very definitely var. *intermedia*, the ♂s with fairly good marginal borders, the ♀s well-scaled with blue, and one can readily understand Staudinger's remarks when he was wrongly considering them as *antiochena*. In his *Cat.*, 2nd ed., p. 14, Staudinger doubtfully includes the Asia Minor specimens with the Persian form, under the name of *bellis*, and does so without doubt in his *Cat.*, 3rd ed., p. 89. The Borjom examples in the British Museum coll. show that the Transcaucasian specimens are of this type; indeed, Romanoff states (*Mém.*, i., p. 53) that "the Caucasian examples differ somewhat from the type, sometimes presenting intermediates between the type and var. *bellis*, Staud. *nec* Frr." (=var. *persica*). Holtz records (*Ill. Woch. für Ent.*, 1897, p. 47) this form from Cilicia, occurring first rather abundantly in May, on the tablelands near Tschekor Köslü; later in June, near Gözna, at 1000m., where they were sitting commonly with other Lycænids at puddles in the road. He adds that "only the beautiful local form, distinguished by the red marginal lunules on the underside of the hindwings, occurs in the Taurus mountains; the ♀ s appear to be comparatively rare, and sometimes exhibit a mixture of violet scaling on the forewings." Miss Fountaine records it (*Ent.*, xxxvii., pp. 79, 158) as occurring at Tchekirghé, near Broussa, between April 17th and May 20th, 1903, and rightly remarks that it is a very distinct form, quite unlike var. *helena* from Greece, or var. *antiochena* from Syria; she also captured one at Amasia, in June, as well as a few in the pine-forest on the old Silva Road, near Tokat, in July.

ε. var. *mesopotamica*, n. var.—♂ 32mm.-33mm., ♀ 33mm. (2 ♂ s, 1 ♀). 2 ♂ s in the British Museum coll. marked "*L. bellis*, Malatia, Mesopotamia, ex. Staudinger," one from the "Gr.-Gr. coll.," the other from "Elwes coll.," are interesting in their thin grey-blue scaling, generally dull appearance, narrow black margin, pure black nervures and discoidal (forewing), and white fringes. The underside has the discoidals and the submedian transverse row of spots well-marked; the faintest possible pale grey crescents outlining the three faint fulvous marginal spots at anal angle of hindwings; the pale grey crescents weakly continued along the hind-margin of hindwing and anal corner of forewing. The ♀, similarly labelled to the ♂ s, is like *persica* in its dark colour, blue-scaled base of all wings on upperside, white fringes, and traces of fulvous crescents at anal angle of hindwing; the spotting of the underside is like that of the ♂ s, except that, on the hindwings, the grey crescents are rather better marked.

It will be observed that, except for the plumbeous or blue-grey scaling of the ♂ s, this is very like our var. *intermedia*. The material at present obtainable is insufficient to determine whether this difference of colour is aberrational or racial.

ζ. var. *persica*, n. var. *Bellis*, Staud., "Cat.," 2nd ed., p. 14 (1871); Rühl, "Pal. Gross-Schmett.," i., pp. 297, 767 (1895); Tutt, "Brit. Butts.," p. 164 (1896); Staud., "Cat.," 3rd ed., p. 89 (1901).—♂ 30mm.-34mm., ♀ 32mm.-37mm. The specimens in the British Museum coll., under the name *bellis*, Frr., have nothing in common with Freyer's form. They are almost all of the striking Persian race, which shows a combination of very marked characters. It averages larger than true *bellis*, *helena*, and *antiochena*. The ♂ s have a very much less bright blue coloration; the margin is wider, much more suffused, and the nervures darker, as in dark European specimens; the discoidal of the forewings well-marked. The ♀ s rather larger than the ♂ s, dark fuscous in colour, the fringes white as in the ♂ s; the bases of all the wings more or less strongly scaled with blue, sometimes the blue spreads over the greater part of the wing, and there are more or less distinct traces of marginal fulvous crescents towards the anal angle of the hindwing. The most marked character, however, is presented by the spotting of the underside. In addition to the strong development of the discoidal and the submedian transverse row of spots, the margin exhibits, on both fore- and hindwings, in both sexes, an almost typical arrangement of the spotting seen in *Polyommatus* (*icarus*, *eros*, *escheri*, etc.), or *Agriades* (*bellargus*, etc.), the dark grey submarginal crescents, enclosing, as it were, the marginal series of marginal black dots, and somewhat poorly-developed series of pale fulvous lunules, giving the race a most ordinary-looking, Plebeiid-spotted, underside. Some of these specimens are unlabelled, but there are four ♂ s and two ♀ s labelled "Zell. coll., 'Astrabad (Lederer) as *bellis*';" one ♀ "Zell. coll., '*bellis*, Täsch (Christ.),'" evidently from Tash near Astrabad; one ♂ two ♀ s, "Zell. coll., '*bellis*, Shahkuh (Chr.)'"; one ♂ and one ♀ "Godman-Salvin coll., '*L. bellis*, N. Persia, ex-Staudinger'"; one ♂ one ♀ "Elwes coll., 'Shahkuh (Funke, 1898)'"; one ♀ "Elwes coll., Shahkuh"; one ♀ "Christoph coll., 'Shahkuh, 24. 6. 78';" one ♀ "Christoph coll., 'Hadscyabad, 7. vi. 1870,'" etc.

In 1862 Staudinger erroneously referred Asia Minor examples of *C. semiargus* to *bellis*, Frr. (*Stett. Ent. Ztg.*, 1862, p. 265), a name bestowed on an entirely different European race of the species. In 1871, he shifted (*Cat.*, 2nd ed., p. 14) the name to the Persian race, and queried the Asia Minor examples as coming under it, noting it as "*bellis*, Frr., major, subtus punctis rufis. Pontus, Hyrcania, ? Asia Minor," and, together with Lederer and Christoph, distributed the Persian examples among European collections under this name. In 1901, he maintained (*Cat.*, 3rd. ed., p. 89), the error, but included the Asia Minor examples without a query, giving "*bellis*—Asia Minor mountains, Hyrcania," as localities. The examples of this race bear no similarity whatever either on the upper- or underside of either sex, to *bellis*, Frr. (which Staudinger re-named *parnassia*), and, in their most extreme forms, approach, in the spotting of the underside, an almost perfect Plebeiid pattern. The differences, as exhibited in the British Museum series, need no further elaboration than our description already gives. The race is particularly characterised by its large size, wide-margin to wings (♂), blue-tinged ♀s (with one or two faint orange spots), and particularly well-defined underside spotting. It differs from *intermedia* in that the latter has a narrower margin (♂), although both have about the same average size, both have strongly blue-tinged ♀s, although *intermedia* is much more strongly marked with orange, and the underside of the latter has the spotting far less completely expressed.

η. var. *helena*, Staud., "Stett. Ent. Ztg.," p. 265 (1862); Mill., "Icon.," p. 326, pl. xxxix., figs. 1-3 (1863); Staud., "Hor. Soc. Ent. Ross.," vi., p. 55 (1870); "Cat.," 2nd ed., p. 14 (1871); Lang, "Butts. Eur.," p. 130 (1884); Kane, "Eur. Butts.," p. 49 (1885); Rühl, "Pal. Gross-Schmett.," i., p. 297 (1895); Tutt, "Brit. Butts.," p. 164 (1896); Staud., "Cat.," 3rd ed., p. 89 (1901); Rebel, "Berl. Ent. Zeits.," xlvii., p. 91 (1902); l., p. 293 (1905); Fountaine, "Ent. Rec.," xiv., pp. 32, 66 (1902). *Parnassia*, Fountaine, "Ent. Rec.," xiv., p. 66 (1902).—Five pairs in good condition from the Taygetos mountains, in the southern part of Peloponesus, captured at the commencement of June, at an altitude of 6000ft.-7000ft., by Kruper. *Lycaena helena* closely approaches *L. semiargus*, Rott. (*acis*, S. V.), which, by the bye, also occurs in Greece. It also comes near *L. antiochena*, Led., which, however, is unknown to me in nature. The eyes are haired as in *L. semiargus*†; nor is there any difference in the shape of the antennal clubs and legs of this insect. The upperside of the wings of the ♂ are of exactly the same colour, dull dark blue, with blackish outer margin and black nervures; the black discoidal lunule is, however, entirely absent in two examples, and only faintly indicated in the others. On the underside of the hindwings there are, on the outer edge, in cells 1*b*, 2, and 3, an orange-yellow band, defined outwardly and inwardly by black spots, of which the inner row is continued in cells 4, 5, and 6, as black spots edged with white; in the forewings, also, in cells 1, 2, and 3, are pale-orange, black-margined, ocellated spots. Otherwise we find the same spotting as in *semiargus*, also the same blue gloss at the base and inner margin of the hindwings. The ♀ of *L. helena* is black-brown on the upperside, a trifle paler than that of *L. semiargus*; only one ♀ shows at the base of the forewings a few blue atoms; one is at once struck by the four broad, almost united, marginal orange spots in cells 1*b*, 2, and 3, of the hindwings, as well as by the pair of very similar, but pale, spots in cells 1 and 2 of the forewings, but which, in two specimens, are almost absent; on the underside, which differs from that of the ♂ only by the brown-grey colour, the orange is present in an enhanced form, and gives the impression of a band on the hindwings; in one specimen, internally, the orange is not at all bordered by black spots, which are also missing from cells 4 and 5, whilst outwardly, in the orange, there is only a pair of small black dots. Although the var. *bellis** of Freyer appears to connect *semiargus* with *helena*, the general impression made by the latter, makes one believe it to be a distinct species. The orange in *bellis** only appears in short, widely-separated, spots, which never create the impression of being band-like;

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† In the *Wien. Ent. Monats.*, 1857, p. 28, Lederer classifies *L. semiargus* (*acis*) with the species having naked eyes, but an ordinary magnifying glass has been sufficient to prove, in all specimens examined, the presence of a distinct, dense, cover of hairs (Staudinger).

* These are, of course, not the true var. *bellis*, Frr., but var. *intermedia*, Tutt.

besides, the specimens before me of *bellis*,* from the Tokat Alps, are almost twice the size of those of *helena*. The appearance of *L. semiargus* from Greece (although I have specimens only from the Parnassus) might also be deemed to show the difference of *L. helena*, for these Greek *semiargus* are only smaller than our German examples, and, notwithstanding that some show faint traces of orange spots, they do not mark an actual transition to *L. helena*. I much regret that I do not know *L. antiochena* in nature, as it seems very much to resemble my new species. That Lederer ascribes naked eyes to this species cannot be important, considering that he also thought *L. semiargus* had naked eyes. But Lederer compares his species (*antiochena*) with *L. sebrus*, and says that the ♂ showed the same violet-blue colour. This fact, coupled with the statement that the orange marginal band of (the ♀ of) his species gradually disappears towards the costa, in addition to the large amount of blue of forewings, and the much larger spots on the underside, cause me to consider *L. helena* to be a distinct species (Staudinger).

This insect has all the general characters, in the ♂, of the Greek race *bellis*, Frr. (*parnassia*, Stdgr.)—small size, brighter colour, narrow margin, faint discoidals, etc., but is a much more highly-developed and beautiful race; the underside, too, is much more specialised in the development of the orange marginal lunules, which here tend to take on a banded form; whilst the ♀ is, both on the upper- and underside, specially strongly marked with orange on the fore- as well as on the hindwings. Staudinger's comparison with *antiochena* is a sound one, since the two are very closely allied. Although described at first as distinct, Staudinger later wrote (*Hor. Soc. Ent. Ross.*, vi., p. 55) that he described *helena* from only five specimens (pairs? see *suprà*) but that he had since come to the conclusion that *helena* was only a more highly-developed form of *parnassia*, of which he had only a few specimens before him at the time. Typical var. *helena*, he says, have, in both sexes on the underside of the hindwings, near the inner margin, an orange band made of united spots, the ♀ even having it on the upperside; this feature, together with the smaller size, and somewhat different tint of blue, separates them markedly as a local race, from *antiochena*, which, judging by a number of specimens of the latter caught by Lederer last year (1867), in the Taurus mountains†, must be certainly considered only as a form of *semiargus*.‡ These examples, of which four of Lederer's are in the British Museum coll., are not *antiochena* at all, nor do they approach the beautiful Syrian race. They are merely blue-suffused (♀) specimens of our var. *intermedia*. The real var. *helena* was also described and figured by Millière, in 1864 (*Iconographie*, p. 326, pl. xxxix., figs. 1-3), from examples taken in the Taygetos mountains, and sent him by Staudinger; he compares the male with *Cupido sebrus* and *Glaucopsyche melanops*. Miss Fountaine's *parnassia* (*Ent. Rec.*, xiv., p. 60) appear to be *helena* in the true sense. She writes that she took examples near Delphi, in May, 1900, that the specimens were confined to the south of the Gulf of Corinth, were very strongly marked, the orange band on the upperside remarkably broad and distinct in nearly all the ♀s captured; she further notes that she took a typically-marked specimen of *C. semiargus* at Zachlaton (most probably, therefore, a specimen of the real *parnassia*, Stdgr.), a short distance only from Kalávryta, at a lower elevation, the var. *helena* occurring generally all round the latter place. In the British Museum coll., under the name of *helena* are five ♂s and five ♀s all collected by Elwes in Morea, May 15th-17th, 1900. The ♂s 28mm-31mm., ♀s 28mm.-30mm. These represent a very distinct race; the ♂s on the upperside entirely blue, with white fringes, narrow linear black margin, and most indistinct discoidal lunules on forewings; the underside finely but typically spotted and with a distinct orange *band* on the hindmargin of the hindwing, edged with grey internally, the grey suffusion being continued on the forewings as well as a suspicion of orange; the ♀s above of a deep fuscous, with a well-defined orange band on the hindmargin of the hindwings and the lower half of the margin of the forewings; the underside almost as in the ♂s. Millière's figures (*Icon.*, pl. xxxix., figs. 1-3), whilst showing the characters of the race, are not too good; the ♂ (fig. 1) is not sufficiently blue, and the margin is too suffused, whilst the orange of the ♀ (fig. 2) is not sufficiently defined, nor is it on the underside of the ♂ (fig. 3), although the small spots are characteristic; from the description it is clear that his specimens were not so well or strongly-marked as those in the British Museum coll. Two of the British Museum coll. specimens, one ♂ and one ♀, have no spotting except the discoidal on the forewings = ab. *antico-obsoleta*, n. ab. Staudinger's last diagnosis of this race (*Cat.*, 3rd ed., p. 89) reads: "Minor subtus fascia marg. rufa. Graec. in mont." Rebel records (*Berl. Ent. Zeits.*, xlvii., p. 91) the capture of this variety by Holtz, in the Taygetos mountains (at Rindomo) at about 1500m. above sea-level, on June 4th, 1901; also by the same collector (*op. cit.*, l., p. 293) on May 18th, 1904, at Hagia Lavrá, at about 1000m. above sea-level.

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* These are, of course, not the true var. *bellis*, Fr., but var. *intermedia*, Tutt.

† The specimens captured by Lederer in the Taurus mountains belong to var. *intermedia*, and have been already referred to (*anteà*, p. 276).

‡ This weakening of Staudinger's as to the specific value of *helena* is probably sound, but as a race *helena* is most distinct; and Staudinger's reference in this paragraph to *antiochena*, on the strength of some specimens of *intermedia* which Lederer distributed (1867) as *antiochena* (and of which we have some of the actual specimens under observation as we write), must not be considered as referring in any way to the true Syrian *antiochena* which Lederer first described and figured (1861), and which bears such a marvellous likeness to *helena*, except for the magnificence of its blue in the ♀, that the two stand separate from all other races of this species.

θ. var. *antiochena*, Led., "Wien. Ent. Monats.," p. 148, pl. i., figs. 2-3 (1861); Staud., "Stett. Ent. Ztg.," p. 265 (1862); "Cat.," 2nd ed., p. 14, *in part* (1871); Rühl, "Pal. Gross-Schmett.," pp. 298, 767, *in part* (1895); Tutt, "Brit. Butts.," p. 164 (1896); Nich., "Ent. Rec.," xiii., pp. 171-172, 207-9 (1901); Elw. and Nich., "Trans. Ent. Soc. Lond.," p. 94 (1901); Staud., "Cat.," 3rd ed., p. 89, *in part* (1901); Fountne., "Ent.," xxxv., p. 98 (1902); Graves, "Ent. Rec.," xviii., p. 150 (1906); xix., p. 68 (1907). ?*Helena*, Nich., "Ent. Rec.," xiii., p. 172 (1901). ?*Bellis*, Nich., "Ent. Rec.," xiii., pp. 207, 209 (1901).—Size and habit is of *Lycaena sebrus*. ♂.—Upperside violet-blue like *L. sebrus*, with narrow blackish border, fine median lunule, and nervures tinged with blackish. ♀.—From the middle of the wing to the inner margin, and from cell 3 to cell 4, blue, the rest of the ground colour brown, the two colours blending with each other; all the wings with a more or less wide orange-yellow marginal band, most distinct at the inner angle, and blending towards the middle of the margin with the ground colour. The underside of the ♂ ash-grey, of the ♀ brown-grey, the hindwings at the base tinged with lilac; all the wings with a fine black discoidal lunule edged with white, and a wavy row of similar spots beyond; on the hindwings is an extra spot towards the base (in cell 8), and from two to four deep pomegranate-yellow spots at the anal angle, which show a more or less distinct blackish margin, and from which fine blackish scales continue as traces of a marginal band; the orange-yellow spots are also visible at the inner angle of the forewings in the ♀, but much fainter. Captured near Antioch. Four ♂s three ♀s (Lederer).

The ♂s in the Britith Museum coll. vary from 27mm.-32mm., the ♀s from 26mm.-28mm. This appears to be the form in which the orange marginal lunules, both on the upper- and underside of the wings, of both sexes, reach their highest development. It is diagnosed by Staudinger (*Cat.*, 3rd ed., p. 89) as "supra al. omn. fascia rufa. Antioch, Syria, Taurus," but this summary leaves out the brilliant blue coloration that also characterises the ♀. It further includes the "Taurus" specimens, which are very different, and belong to var. *intermedia*. Lederer's figures (*Wien. Ent. Monats.*, v., pl. i., figs. 2-3), bad as they may appear in black and white, leave no doubt whatever as to the form they are intended to represent, *viz.*, the extreme development of var. *helena* in which the ♂ s are of the same clear blue, with white fringes and linear black marginal borders to the wings, but with traces of pinky-fulvous showing through on the upperside of the hindwings, whilst the ♀ has the same distinct orange band, but the ground colour of the forewing and hindwing suffused with a beautiful bright blue from the base to the orange band, and from the inner margin to the subcostal nervure, and, in the hindwing, extending sometimes even to the outer margin above the orange band. The underside has, in both sexes, larger and better-developed spots in the submedian rows of both fore- and hindwings, and the orange is also well-developed on both wings, less so, however, than in those of the var. *helena* in the British Museum coll. These examples are labelled—two ♂ s "Djebel Kineyseh, Syria, 1900 (Nicholl)," one ♂ "Lebanon, 5500ft. (Nicholl)," one ♂ "Cedars of Lebanon, 21. v. 1900 (Nicholl)," one ♀ "Lebanon, 4500ft., vi. 1900 (Nicholl)," one ♀ "Lebanon, 7000ft., vi. 1900 (Nicholl)," the latter not so brightly-coloured as the other ♀. Our own examples from "Ain Zahalta (Graves)," show this to be a most beautiful insect; the ♂ s with a marginal row of red lunules on the upperside of the hindwings, the ♀ with its mixture of brilliant blue and orange, a most delightful insect. Mrs. Nicholl records (*Ent. Rec.*, xiii., p. 171) the capture of this extreme form, May 14th, 1900, at Beit Chabab, a flourishing village in the Lebanon, at about 3000ft. elevation, also on May 17th, 1900, on the lower slopes of Djebel Sunnin, near Zahleh, at about 5000ft. elevation, whilst two days later, on the eastern side of the ridge, she states that only the var. *helena** occurred, but no more *antiochena*. Miss Fountaine says (*Ent.*, xxxv., p. 98) that the var. *antiochena* was common near Maharain, in the neighbourhood of Ain Zahalta, in April, 1901, the ♀ s much rarer than the ♂ s but extremely beautiful, being shot with vivid blue on all the wings, in addition to the broad orange border; all the ♂ s had minute orange spots on the hindwings, on the upperside, near the anal angle, more distinct, and on all the wings, beneath, in both sexes. Miss Fountaine states that she could not trace much resemblance to *C. semiargus* in either sex, in size, shape, or colour. Graves took this beautiful form at the Ain Zahalta Cedars, Jebel Barouk, at about 6500ft. elevation, though a worn ♂ was captured some 2000ft. lower; he adds (*in litt.*) that, "although this is always said to be a variety of *C. semiargus*, it appears not to bear the slightest resemblance to the *semiargus* of the Grisons; the development of the reddish-orange markings, so beautifully developed in this species, is noticeable in several other

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* One of these specimens is apparently in the British Museum coll., and appears to be merely a less brilliantly coloured example of *antiochena* than the others, which are exceptionally fine.

Lycænids taken in Syria, *e.g.*, *Plebeius nicholli*, *Polyommatus icarus*, *Aricia astrarche*, etc.; in the last two species, the reddish band of the underside of the hindwings is always pronounced." It might appear that the Lebanon is the boundary between the two forms *antiochena* and *persica* (*bellis*, Staud.), from Mrs. Nicholl's assertion (*Ent. Rec.*, xiii., p. 209) that they inhabit the Lebanon at different elevations, *antiochena*, from 2000ft.-4000ft., and *bellis* (following Staudinger), from 4000ft.-5000ft., but our own beautiful specimens of *antiochena* were taken by Graves at an elevation of 5000ft., and the magnificent specimens of *antiochena* in the British Museum coll., taken by Mrs. Nicholl herself, are labelled as having been taken at 5500ft., 4500ft., 7000ft., etc., at the latter elevation, somewhat more suffused, but still distinctly *antiochena* both on the upper- and undersides. Her further remark (*op. cit.* pp. 172, 207) that *bellis* (*helena*) was not uncommon in the Lebanon at the elevation named, occurring at Djebel Kineyseh and Djebel Sunnin, and also (*op. cit.* pp. 171-2) that, on May 14th, 1900, at Beit Chabab, on May 17th, 1900, on the lower slopes of the Djebel Sunnin, she took only var. *antiochena*, but that, on May 19th, on the eastern side of the ridge, *bellis* only occurred, but no *antiochena*, whilst from June 14th-17th, on the Djebel Sunnin, again only *bellis* were taken (*op. cit.*, p. 207), and no *antiochena*, suggests that she is only dealing here with more-highly and less-highly developed forms of the same var. *antiochena*. Certainly the specimens in the British Museum coll., from the Djebel Kineyseh, etc., are *antiochena*, and not *bellis*, *persica*, or any other oriental race.

Egglaying.—Females observed flying around clumps of red-clover (*Trifolium pratensis*) on May 22nd, 1886, and others on June 6th, 1896, were noticed to settle successively on the flower-heads that were not yet quite fully out, an examination of these heads showing many eggs, three or four, or even more, sometimes being found on the same head; further examination showed that most of the heads had had eggs deposited on them. Some ♀ s confined over a plant of *T. pratensis* in the garden, laid very freely on the flowers (Brabant). Chapman observes (*in litt.*) that the favourite position for the egg to be deposited is outside the calyx, at its margin, just below the calyx-teeth, or just on the base of a tooth, rarely just appreciably lower, and occasionally on the corolla. He observes that this is very similar to the habit of *Cupido minimus*, and notes that these two insects, having somewhat similarly-marked undersides, had been erroneously supposed to be closely related; as this is not so, he wonders whether there is any natural co-relation between the habit and the pattern. Frohawk observes that about 36 eggs laid in confinement on July 5th-6th, 1907, on young plants of *Anthyllis vulneraria*, by four ♀ s sent from Vienna, were all placed on the calyces of the flowers, mostly near the base, and often hidden between them. Eggs laid May 23rd, 1886, hatched before June 6th (Brabant) and produced larvæ that gave a second brood in July of the same year, others laid July 5th, 1907, hatched July 15th, and produced larvæ that hybernated (Frohawk). [Rühl's statement (*Pal. Gross.-Schmett.*, p. 767) that it "lays its eggs in rows on the foodplant," and Breit's (*Soc. Ent.*, xiv., p. 99) that "the eggs are laid on *Scabiosa succisa*, and other low plants," are evidently far from the truth.]

Ovum.—The egg is of the usual Plebeiid form (cheese-shaped), 0·5mm. across, the height about 0·27mm., the level (top and bottom), about 0·43mm. across, leaving 0·07mm. for the projection of the rounded margin. The micropylar area is exceedingly small, compared with that of various other Lycænid eggs, the diameter of the area free from white coating being less than 0·02mm. The sculpturing of the white coating is in cells, nearly square, quite so on the sides, the squares being formed by the lines of their margins passing spirally outwards from the centre, and crossing each other at right angles, quite unlike the triangular arrangement so frequent in Lycænid eggs. As usual, the cells are smaller centrally, and larger towards the margin, where they are about 0·025mm.-0·03mm. in diameter; the pillars at the angles are short and broad, somewhat square, with sometimes an appearance of being four pillars fused together, occasionally the presence of a central hollow is all that suggests such a compound structure. Some eggs are very regularly marked, the cells being rectangular almost all over, others have pentagons and other irregularities in various places, but especially along the margins where the curvature is greatest (Chapman). The egg is ·025in. wide, and ·0104in. high. [It is very similar to that of *Lycaena arion*, of almost the same size, and of similar structure; the micropyle, however, is much smaller, and but slightly sunken, resembling in this respect the egg of *Everes argiades*.] The whole surface is covered with a beautiful reticulated pattern; the reticulations surrounding the micropyle are simple, but gradually develop at each juncture into raised knobs, which are prominent elsewhere over the surface. All the reticulations resemble white-frosted glass, reflecting the beautiful pale blue-green ground colour of the egg. Shortly before hatching it assumes a greyish tinge (Frohawk). The egg of *C. semiargus* dissected from a ♀, is of a bright green colour, of comparatively small size, circular in outline, a depressed sphere (or rather a squat cylinder) in form, rounded on all its edges, much flattened medially on its upper surface, but the micropylar depression very slight. The surface of the egg appears to be covered with an echinoid reticulation, the points being of a whitish colour, the reticulation of the upper surface being less developed than that of the other part of the surface. The basal area of attachment appears to be of about the same size as the flattened area of the upper surface. [Described August 7th, 1907, under a hand lens, from an egg dissected from a ♀ taken on the St. Gothard Pass, August 3rd, 1907. Other details could not be made out with the power at disposal.] The egg is figured by Clark (*Ent. Rec.*, xii., pl. xi., fig. 4 (6 by error); see also our own figure by Tonge.

Habits of larva.—The larva usually eats about three-fourths of the uppersurface of the egg, including the micropylar area, when it escapes, sometimes the amount is rather less, and sometimes the side suffers as well as the top. When hatched, the young larva bores through the corolla, and usually goes direct to the ovary; it eats, however, not unfrequently, portions of the corolla and stamens. This is, however, more frequently the case in the second instar. Almost always in the first, and usually in the second, stadium, the larva is found with its head as low down in the corolla and calyx, as the amount it has eaten of the ovary allows it to be, and this attitude seems to be that in which it undergoes the first moult. It goes from flower to flower, eating chiefly the ovaries; how often, if at all, it does this during the first instar, I have no definite observation recorded. By August 26th, 1907, two of the larvæ, respectively 2·3mm. and 3·4mm. long, appear to be in the second and third instars, the former just about to moult, the latter having already moulted; they differ in size, and in the relative sizes and closeness of the black spots, suggesting that one is an instar beyond the other. They are alike in being studies in black and white; the ground colour is not quite white, but faintly fuscous-creamy, yet white enough to make the black dots contrast very markedly; these dots are the hair-bases and lenticles, and also the spiracles; these are all much the same in size, although the spiracles are really a little larger, but have the same effect on the eye, because they are thin circles with a colourless lumen. The two larvæ are to be observed on a head of red clover, on which five or six newly-hatched larvæ were placed, and on which, a few days ago, no larvæ could be detected, but which now exhibits these, probably as the sole survivors; the younger one, now about to moult, is seated on the outside of a calyx, than which it is a little shorter. The flowers show by holes in the calyces and ovaries, that the larvæ burrowed in at least several flowers in this way, the desired morsels being the ovules. When unseen, the small larvæ may have escaped observation from their small size and want of colour, but more probably were partially or wholly buried in the calyces. After the second moult the larvæ enter hybernation. On February 2nd, 1908, one larva, that had been out of doors on a plant of *Trifolium pratensis* all the winter, was noted as rather over 4mm. long, of a pale green colour, with the dotting of the black hair-bases very conspicuous; it was amongst some dead leaves, but when put on the plant soon buried itself among the stipules of the young shoots now about an inch long. Two others in a tin box in the cellar, also seem to be alive on this date, but are very quiescent; they are rather smaller than the other, broad, of a brownish-terra-cotta colour, and with conspicuous black hair-bases. One of these larvæ died soon afterwards, and, by the end of March, one of the others was detected hiding in a sheathing-stipule of a clover plant on which they were, with its head thrust down as far as possible between the stipule and the stem; it was pale cinereous, or nearly white, in colour, with the hair-bases as black points. About April 4th, the same larva, apparently, was noted, just above where it had been last seen, on the outside of a young green stipule, which still enclosed the leading-bud; in this it was eating a hole, apparently to get at the younger tissues within; it had some coloration and oblique stripes. On April 10th, on looking for this larva, the second larva was discovered, precisely where the other had been noticed some time back, deeply wedged into the angle between the petiole and stipule and the stem, and pale as was the other when first seen. A further search did not reveal the other larva, till a leaf, unopened, but already on a tall stalk, showed evidence of being eaten, as to one of its edges, and, on this, the other larva was seen. It may be noted that a young leaf on this same branch, shows that it must have been nibbled before it left the shelter of the bud, probably by larva number one, some time before it was first noticed, and most likely by reaching it through the stipular sheath, as already observed; all three leaflets are injured, one having little left beyond the midrib, but they were, from the recovery that has taken place, no doubt comparatively minute when the damage was done. At the moment of writing, larva number one has eaten a good bit of the outer part of the leaf, *i.e.*, nearly half of the outer half of the outer leaflet; the leaflets are beginning to slightly separate, and the larva has bored a hole through the inner half of this leaflet, and is half-way through it, and so reaches the margin of the outer leaflet (missing the middle one) of the other side, which it is eating. The general colour is a light green, with some scattered hairs (no black points), a longitudinal stripe of yellower-green, with paler borders just below the darker dorsal line, and then a darker, slightly echeloned, stripe followed again by a paler (yellower) band. Then the marginal flange with more abundant hairs on a paler margin, and slightly darker above. One of the larvæ left its leaf on April 13th, and rested for the night on the stem, but returned to its leaf the next morning; it is now 6mm. long, of a green just matching the clover-leaf, and is of a very transparent glassy appearance, due essentially to the larval coloration. By April 20th, one larva had fed so far ahead of the other, that, on this day, both moulted, one into the final, the other into the penultimate, instar. The more backward one is only 4·4mm. long, and it moulted between two leaflets, so fastened together as to form a little pocket or cocoon. The skin cast by the larva remains distended, is, in fact, a little, balloon-like, blown larva skin, 4mm. long and 2mm. across. The larva escaped by an opening, extending from the head in front down each side to the middle of the mesothorax on one side, to its posterior border on the other; not quite down the side, however, but more dorsally, so that the dorsal flap is triangular, the prothoracic spiracle being on the ventral portion, to which, also, the head is attached. The larvæ now seem to prefer the young tissues encased in the sheathing stipules, burrowing into these, and even getting quite out of sight; they seem to like the growing stem better than the young leaves. When nearly fullgrown, one of the larvæ was noted to eat a leaf still unfolded, but quite outside the sheaths of the bud. As it gets older the larva eats less, is very lethargic, and acquires a yellow tinge before pupation (Chapman). Frohawk says that the young larva makes its exit from the egg, by eating a small hole in its side, just large enough to allow of its escape; the newly-hatched larvæ ate through the bases of the calyces of the flowers of *Anthyllis vulneraria*, and commenced feeding on the green seed-pods within; they continue to feed on the seed-pods during the second and third stages, but they do not refuse the yellow petals of the flowers, and feed, indeed, on all parts of the bloom; those that feed on the petals are distinctly yellower in colour. Besides the flowers of *Anthyllis vulneraria*, the larvæ feed freely on white and pink clover-blossoms, preferring pink, however, greedily devouring them and eating all parts of the blossom. In the early part of August, the larvæ prepare for hybernation, and some kept by Frohawk concealed themselves within the calyces of *Anthyllis* during the second week of August, others hid under the leaf-like bracts, and yet others between the calyces, whilst others were already at rest (hybernating) on clover-flowers. Although these larvæ were kept in a warm temperature, fully exposed to the early morning sunshine, they remained quite motionless during the hot days of August and September. During the first week of September, a few of these larvæ, hybernating on flower-heads of clover and *Anthyllis*, were placed out of doors, the pots containing the plants only protected by gauze covers, so that the larvæ were subjected to all conditions of weather through the autumn and winter, and were thus kept in an almost natural state. On January 20th, 1908, one of the larvæ was observed on a brown dead clover-blossom, apparently perfectly healthy, not having moved since the middle of August, whilst another in a similar condition was on a dead flower-head of *Anthyllis*. On February 22nd, a careful examination of the plants out of doors, and in a cold conservatory, resulted in finding altogether nine hybernating larvæ that had apparently not moved since entering into hybernation; they were very difficult to detect, some between the calyces of the dead *Anthyllis*, others within them, some on the leaf-bracts, and one on a dead *Anthyllis*-stem at the base of a withered leaf, whilst two were on dead clover flower-heads between the petals; in all cases the larvæ were resting with their heads pointing inwards, towards the base of the flowers. On March 20th, three larvæ moved from their hybernacula, the others remaining motionless; three more became active on March 24th; on April 1st, another left its hybernaculum, whilst the last one shifted its position on May 3rd, but still remained on the dead part of the plant on which it had wintered; on May 17th, it shifted its position again, and was placed on a clover-blossom, on which it remained for a week, and then died on May 25th, having lived for about 280 days without feeding. Those that first awakened in spring were placed on separate blossoms of *Ulex europaeus* on March 20th; on March 24th one was noticed to have been feeding on the inside cuticle of the calyx, whilst another was observed feeding on the petals of another flower; one was fed up successfully throughout on furze-blossom. Young shoots of clover were given those that became active on March 24th, and on these they fed, perforating the leaves, and boring into the swollen shoots enveloping the young leaves, feeding on the interior in the same way as *Celastrina argiolus* larvæ feed on young holly-berries. After hybernation they feed on for nearly a month before moulting, remaining fixed for some days before the actual change of skin takes place; they continue feeding preferably on tender shoots of clover, preferring the young expanding heads of the plant, and feed at all times during the day. When crawling and feeding, the small shining black head is frequently protruded beyond the prothorax, but when at rest it is entirely retracted. Brabant says that the summer larvæ, coming from the eggs of May-June butterflies laid on the calyces of common red clover, *Trifolium pratense*, hide themselves entirely in the flowerheads of the clover, their dirty green colour and reddish dorsal and lateral lines helping effectively to hide them (June 13th, 1886), when young; in fifteen days more they have grown very considerably, are now of a pale green tint, with a darker green mediodorsal line, and covered with a short thick coating of hairs with black bases. From this time the larvæ under observation were fed in confinement on flowers of red clover, which they ate greedily, the full-fed larvæ becoming entirely of a pretty apple-green colour, with a mediodorsal line of deeper green, and the black head retractile within the prothorax, and almost always covered thereby. These larvæ ceased to eat in the commencement of July, they became paler in colour, and sought a suitable spot for pupation. [Rühl states that the larva is full-fed in autumn, and that the species hybernates as pupa. This statement appears to have been derived from the circumstantial account given by Assmuss* (*Stett. Ent. Ztg.*, xxiv., p. 393), but is evidently entirely wrong.] If late pupæ are found, the imagines emerge the same year and lay eggs. Hybernation appears always to take place in the third larval instar.

ONTOGENY OF THE LARVA.—*First instar* (newly-hatched): Very small, only ·03in. long, but stout in proportion. [It is almost exactly similar in all respects to that of *Lycaena arion*, but the hairs of *Cyaniris semiargus* are longer and the general colour of the body is of a greener type.] It has a shallow dorsal longitudinal furrow on the prothorax, which is the widest segment where also is a large dorsal disc and a smaller one on the anal segment; both are somewhat glazed and grey in colour. The body is pale greenish-blue-grey with citrine-yellow shadows; along the dorsal surface are longitudinal rows of very long, and also short, glassy-white, finely-serrated, hairs, placed in pairs on each segment, bordering the furrow, the first one very long the second short; both curve backwards, and have dark olive-brown pedestal bases; below are two very small hairs projecting laterally; the spiracles are large and dusky. On each segment are three subspiracular hairs, which are long and project laterally also; the central one is very long. Below, on the lateral lobe, are two other similar but shorter hairs, and others on the claspers; they all have dark bulbous bases. The head is shining brownish-black. The entire surface is sprinkled with blackish points. The legs and claspers are of the same colour as the body. *Second instar:* After the first moult it is a good deal similar to the previous stage, but has additional hairs and three subdorsal spiracular-like discs on either side of each segment, and one sublateral; the surface is covered with raised greyish points. On the first segment is a dorsal shield-like disc, slightly sunken, and of a dull olive-colour, beset with little circular discs varying in size. The colour of the larva is pale ochreous, with faint longitudinal mediodorsal and lateral lines and oblique side-stripes of a slightly darker ochreous. Later, but before the second moult, it is $\frac{1}{9}$ in. long. The colouring is paler and markings more indistinct. In some specimens the colour is almost uniformly of a pale ochreous-yellow. *Third instar:* At the hybernation stage, it is $\frac{3}{16}$ in. long, the segmental divisions are deeply cut, the body is thickly studded with white serrated hairs, each with an ochreous-brown tubular base, and black spiracular-like discs. On the 7th abdominal segment is a dorsal transverse gland, very similar to that of *Lycaena arion;* at the edge of the gland are a few minute white hairs with branching tips. [A tiny bead of liquid was noticed exuding from it.] The dorsal disc on the prothorax is fan-shaped, with a glazed surface beset with minute discs, as in previous stage, but it has, in addition, three hairs. The

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* One wonders what species Assmuss did get. His note reads: "*Lycaena acis.* I met with the larva of this insect in the Government of Pskow, near Toropetz, and on the border of the Poretschje district, Government of Smolensk, in August, 1860, nearly full-grown. It is finely haired, of a dirty yellowish-green colour, with darker dorsal and lateral lines. Head and legs dark brown, and also the spiracles, the form of the larva is woodlouse-like, as a matter of course. It lives on *Anthyllis vulneraria.* In September it changes into a pupa, oval, pale olive-green, becoming olive-brown after a time, hybernates, and does not produce the butterfly till the middle of May. The pupa hangs fixed at the anal end to the stem of its foodplant. A girth round the body is also present."

whole colouring of the body is pale ochreous-yellow, with mediodorsal, subdorsal, and subspiracular pale rust-red stripes, which are broken up on each segment, being composed of a series of short bands, and those forming the subdorsal series are slightly oblique; the lateral stripe is continuous round the broad, rounded, and somewhat flattened anal extremity; the head is black and shining. Some specimens are paler than others, and some are distinctly yellow after feeding on the yellow petals of the flowers. In general appearance and structure they are very like *Lycaena arion* larvæ, but less pink in colour. After hybernation, but before the 3rd moult (239 days old) the larva measures $\frac{1}{6}$ in. long when fixed for moulting; it is of a very pale yellowish flesh-colour; all the markings dull pale pinkish, giving the larva a pale flesh-coloured appearance. *Fourth instar:* Measures $\frac{1}{5}$ in. long (245 days old). The ground colour is now of a pale ochreous-green, with the dorsal, subdorsal, and lateral stripes dull pinkish-drab; otherwise it is very similar to the previous stage, excepting that it is more densely studded with hairs of varying lengths, each with a darker green truncated swollen base encircled with a series of black points; there are also numerous spiracular-like discs; there is a gland on the 7th abdominal segment, and, on the 8th abdominal segment, below and behind each spiracle, is a retractile tubercle. *April 26th*[*]*:* The larva is in this stage wholly of a clear green colour. Shortly before the fifth (?fourth) moult it measures $\frac{3}{10}$ in. long. It is similar to previous stage, excepting that the hairs are longer, and the ground colour is a clear light green, with darker green, but somewhat indistinct, markings. *Fifth instar*[†] (full grown): Now measures ·6 in. long (about 275 days old). In shape and size it greatly resembles *Lycaena arion* larva. The small shining black head is set on a moderately long retractile neck, which is frequently produced beyond the 1st segment while it is crawling and feeding, which, when at rest, is completely withdrawn and hidden in the segment. Although the head is disproportionately small for the size of the larva, it is more than twice the size of the minute head of *L. arion* larva. *Dorsal view:* The anterior and posterior segments are over-lapping and rounded; the body narrowest anteriorly, widening to the 8th segment; the segmental divisions are deeply cut, each segment boldly convexed. *Lateral view:* First anterior and last three posterior segments flattened and projecting laterally; the mesothorax to 7th abdominal segment humped dorsally; a slight mediodorsal furrow; the sides sloping and lateral ridge dilated, ventral surface bulbous and ample. The whole body is rather densely sprinkled with finely serrated spinous hairs; the longest are along the dorsal surface and lateral ridge, where they form a projecting fringe all round the larva, and the first two segments are also covered with longish hairs, and a few are scattered along the subdorsal region; all these longer hairs are pale brownish, becoming whitish towards the base, which is in the form of a pedestal, and of a greenish-white colour; the other hairs are very minute, white, and glassy. On the prothorax is a fan-shaped whitish dorsal disc,

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[*] Frohawk calls this the "Fifth instar," but seems to have judged this to be so entirely from its different size and its greener tint, changes that occur apparently in this stage without a moult.

[†] Frohawk calls this the "Sixth instar," it is most probably the "fifth." Chapman only notes five instars in those he reared at the same time (see *posteà*).

PLATE XXXV.

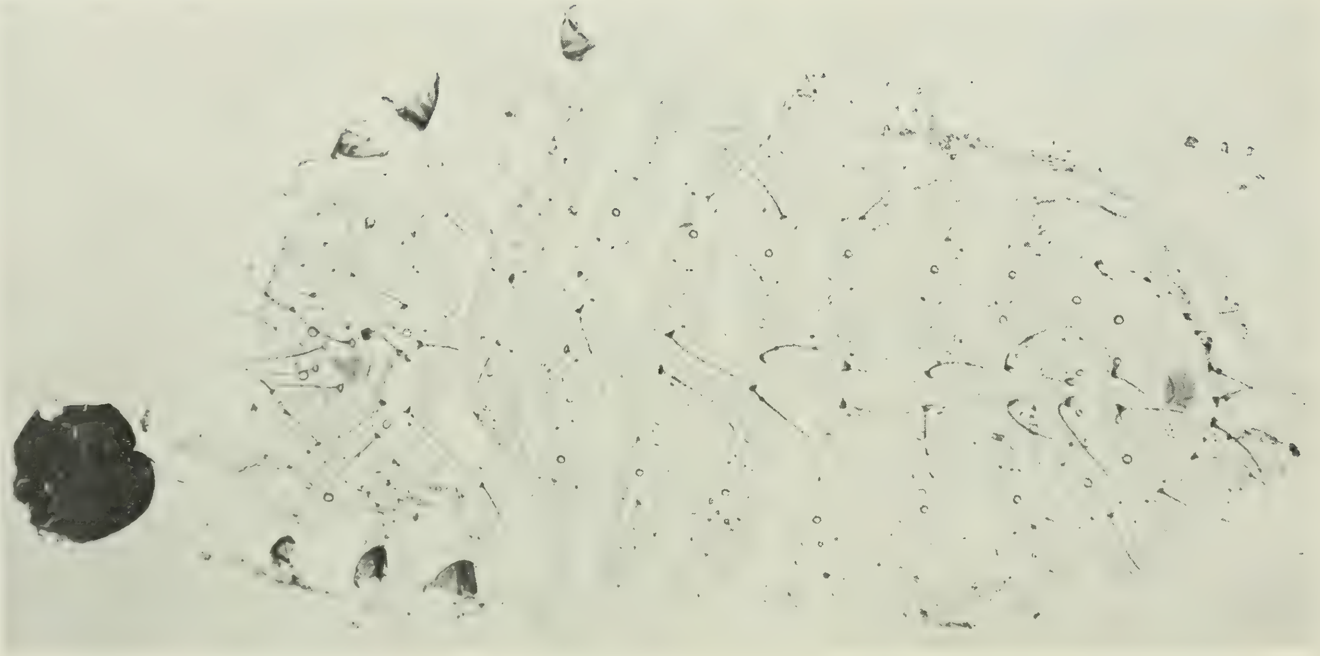

Photo. F. N. Clark.

LARVAL SKIN OF CYANIRIS SEMIARGUS, FIRST INSTAR × 60.

A Natural History of the British Butterflies, etc., 1909.

[*To face p. 289.*]

studded with shining black raised processes and tiny white hairs; scattered over the body are shining black spiracular-like discs, very small, common to the Lycænid larvæ. On the 7th abdominal segment is a transverse gland, very like that on the same segment of *Lycaena arion* larva, but in *C. semiargus* (*acis*) it is not fringed with extremely minute branching hairs, but is, instead, surrounded by numerous little circular discs and tiny white simple hairs; and on each side of the 8th abdominal segment is a retractile whitish tubercle; the claspers and ventral surface are glaucous; the legs whitish, ringed with dark olive (Frohawk). See also Brabant (*Bull. Soc. Ent. France*, 1896, p. 260).

Larva.—*First instar:* When hatched barely 1·00mm. long, and at most 1·8mm. when full-grown, and with head stretched to full length of "neck." The head is black, or nearly so, and the rest of the larva a pale ochreous; "colourless," though not correct, would, perhaps, nevertheless, convey a more adequate idea of the uniformity of tint, and want of colour, suggesting very strongly an internal feeder, which in truth it is during the first instar; the hairs are colourless, but their points of origin are dark like the head, but so small as to require a good deal of magnification to become visible. The general arrangement of hairs, lenticles, etc., is the same as that described in *Plebeius argus* (*aegon*), and as obtains throughout the Plebeiids. The seta on tubercle i is, on the 3rd and following abdominal segments, about 0.2mm. long, the largest nearly 0·3mm.; that on ii is a very faint, hardly visible, hair, not more than half as long; on the forward segments these hairs are shorter. On the mesothorax one of the four (usual) flange-hairs is replaced by a minute lenticle, strongly suggesting a spiracle; this is usual, but not invariable, four hairs being sometimes present. The two minute hairs (iii ?) between the lenticles and spiracles are hardly clubbed, but retain the same thickness throughout their length; the front one is about 0·024mm. long, the posterior about half this. The prothoracic plate has the four usual long hairs, two short ones near the front angle, and the two lenticles are large, the special hairs at outer angles are more like ordinary hairs than they are later; this is usual in the first instar of other species. The dorsal hairs and lenticles on the 6th, 7th, and 8th abdominal segments are all quite separate, not fused as they are, or appear to be, where they are largely developed, as in *Plebeius argus* (*aegon*). The prolegs have, on each pad, one hook and a chitinous point representing another; this second hook is sometimes a hook, sometimes only a point on the claspers. *Second instar:* 2·0mm. long when half-fed, and not specially stretched; head black; true legs dark tinted; hair-bases black, and more numerous than in first skin; skin-colour itself still somewhat uniform, but fuscous rather than ochreous as in previous instar—fuscous, however, must be understood as varying from white or colourless in that direction, and not by any means otherwise than very pale. By July 25th, 1907, the larva was full-grown in the second instar, of a greenish-grey ground colour, with rather bright red, dorsal, subdorsal, and double lateral lines; the subdorsal line consists of slightly oblique lines on each segment, but so that that on the following segment begins just above that on the preceding. Head very small, black; prothoracic plate depressed, faintly browner than the ground colour; the upper lateral line in the marginal flange, the lower, the true (?) marginal, or lower lateral, flange quite ventral, in the usual Lycænid larval form. Hairs, though long, are fine and inconspicuous, the dorsal crests rise between dorsal and subdorsal lines. In this (second) instar, the prothoracic plate has lost the two front small hairs, the forward pair of long hairs being replaced by a pair of lenticles, making four lenticles; the posterior pair persist, and the special (angular) pair are now characteristic. On the mesothorax is a large high central (azygos) lenticle, with three (one unpaired) dorsal hairs in front of it, then the setæ of i and ii (?) with an accessory hair behind, then one long and two short hairs, and then a lenticle, quite in line with, and looking like, a spiracle, then nine hairs (flange series) and a lenticle, and five or six hairs (marginal series). The metathorax is the same, except that it wants the dorsal lenticle, but has one just outside i and ii. Taking the 2nd abdominal as typical of the abdominal series, there are—the setæ of i and ii; internal to i, and in front of it, a short hair, and another external to it; then two short hairs, very like the two short hairs (iii ?) of first instar, but between these and spiracles are (1) a large hair directly above spiracle (iii ?), (2) a short hair in front of the two large lenticles, and behind it; below the spiracle, five or six flange-hairs (about 0·25mm. long), and, on marginals, a lenticle and three or four hairs. The hair-bases show only a trace of a crown (or star) of spines, but the lenticles generally show them as marginal irregularities. Lenticles are more abundant on the 7th, 8th, and 9th abdominal segments. The honey-gland is indicated, but the fan is not clearly made out. Each pad of prolegs and claspers shows a larger and smaller hook. *Third instar* (before hybernation, August 26th 1907): The head is black; the prothoracic plate square (with angles front, back, and lateral), the front angle rounded, the posterior with a short, backward, square prolongation; it is outlined black, with black hair-bases and lenticles. Each segment has a row of black dots along front and back margin, meeting near the dorsum, and joining a group about the spiracles; some of these are hair-bases, some lenticles. The hairs are colourless; those of tubercles i and ii may perhaps be recognised, also one above spiracles, and several marginal ones. The larva still has the same three reddish lines as in the preceding instar, of which the intermediate one is sufficiently zig-zagged to make it clearly belong to the oblique series. None of the larvæ has definite dorsal flanges; they are, in fact, very rounded when fat, a little flattened below when small, in this instar. *Third instar* (after hybernation, April 14th, 1908): 4·4mm. long. The head is black, polished. The body of a green just matching the clover-leaf, of a very transparent, glassy appearance, the coloration assisting this appearance; it has a darker dorsal stripe, and a dark stripe rather above the middle of the slope; this is somewhat *en echelon* on the segments, the forward end being the higher. The darkness of this stripe is slight, as though an attempt to tint them brown had all but failed. The obliquity of the lateral one is due to its occupying the area between two pale fine lines, that are the oblique lines proper. The dorsal line has a pale border that is not continuous with the oblique lines, but the upper border of the lateral band is a pale line that (with a little twist) is continuous with another margining the lower border of the dark patch on the next segment behind, which, again, is continuous with one on the segment behind, passing obliquely downward and backwards through the spiracle;

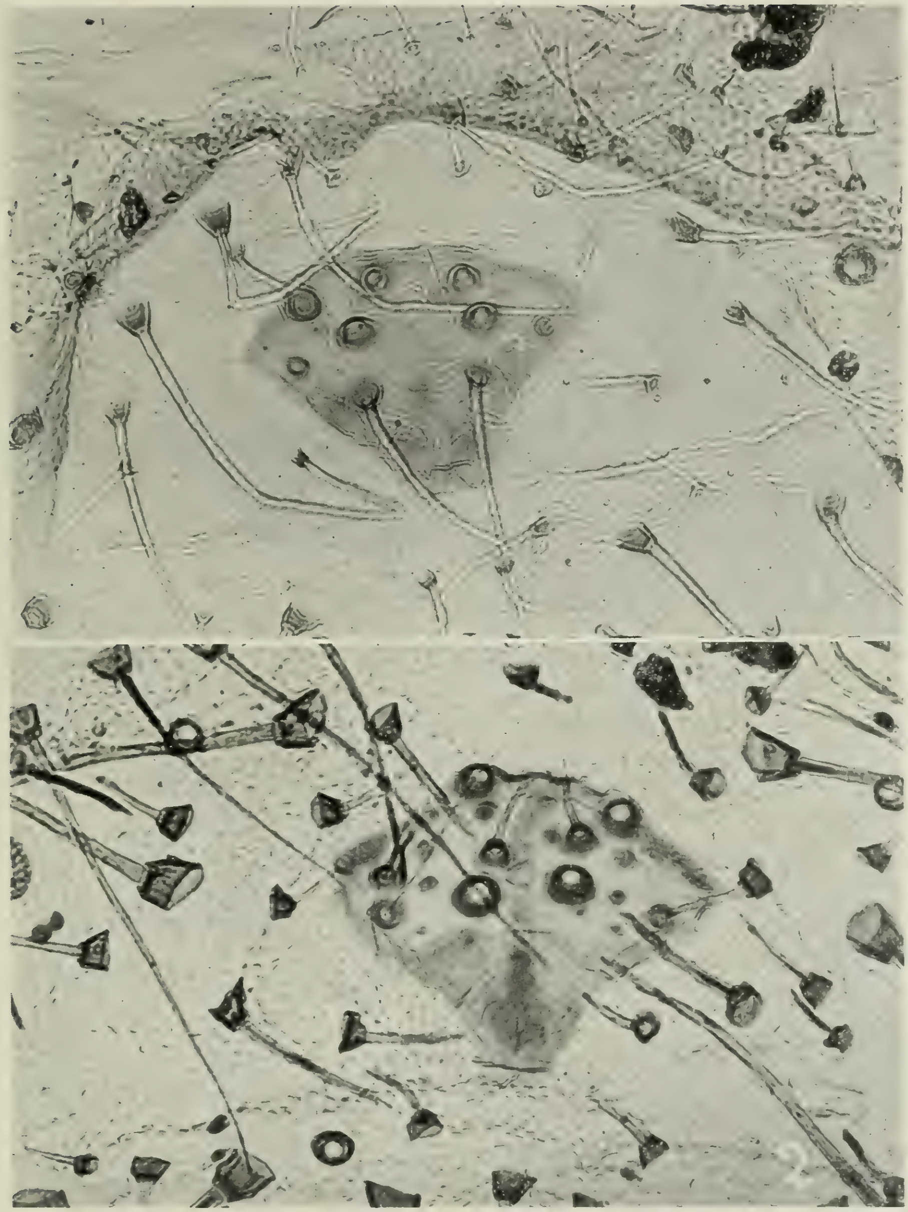

Photo. F. N. Clark.

Larval structure of Cyaniris semiargus.

1. Prothoracic plate, second instar (showing special hairs at angles).
2. Prothoracic plate, third instar (special hairs well shown; lenticles and ordinary hairs quite different from those of fig. 1), both × 150.

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[*To face p. 290.*]

PLATE XXXVII.

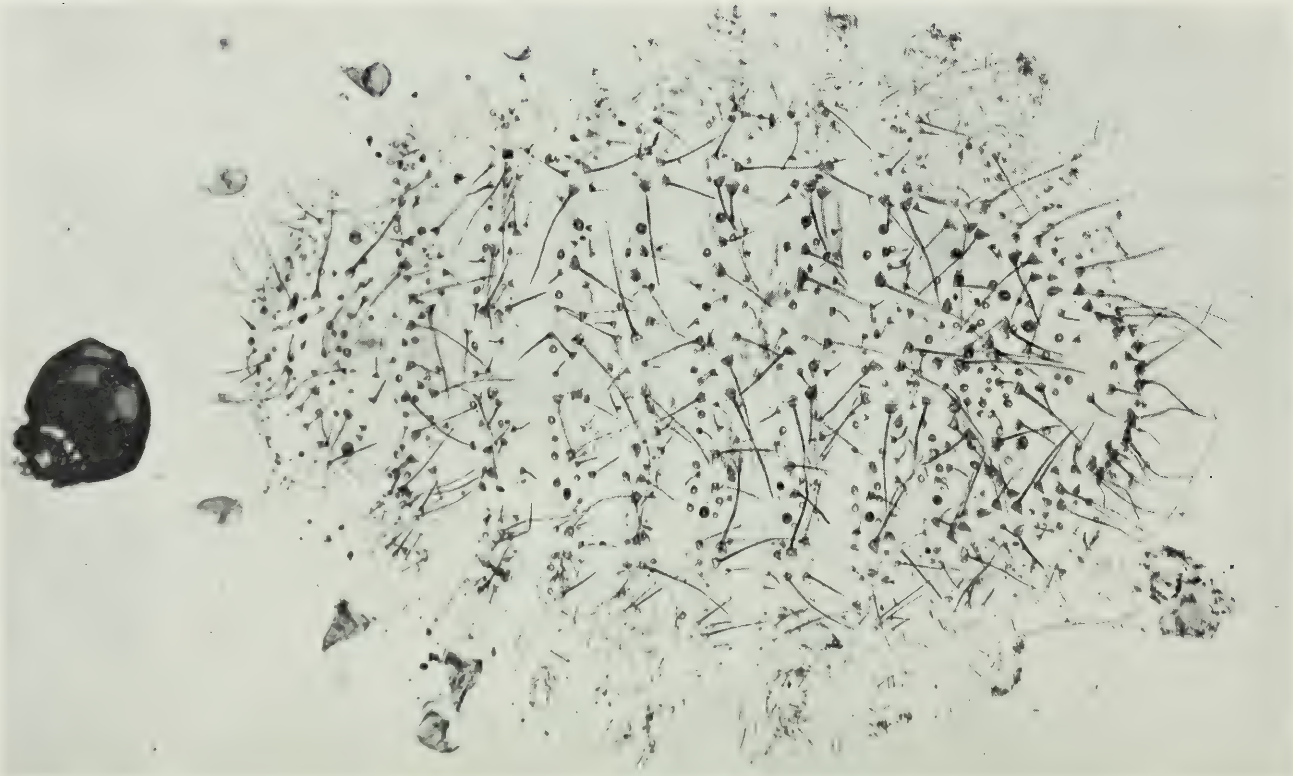

Photo. F. N. Clark.

LARVAL SKIN OF CYANIRIS SEMIARGUS, THIRD (HYBERNATING) INSTAR × 30.

A Natural History of the British Butterflies, etc., 1909.

[*To face p. 291.*]

Plate XXXVIII.

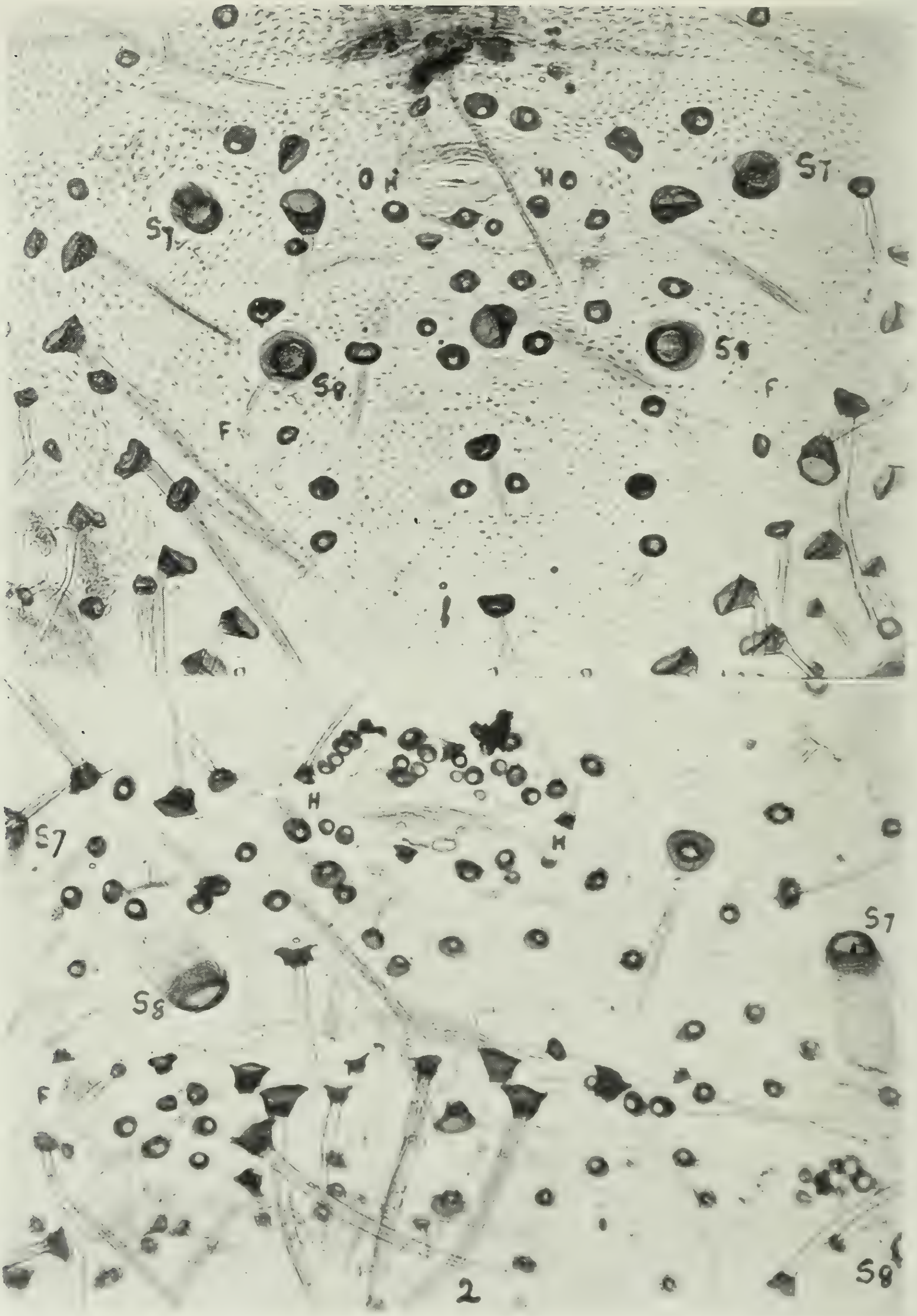

Photo. F. N. Clark.

Larval structure of Cyaniris semiargus.

1. Honey-gland (H), fan-tubes (F), spiracles (S) of the 7th and 8th abdominal segments, third instar × 100. 2. The same, penultimate instar (showing increase in number of lenticles round honey-gland) × 100.

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the lateral line is pale greenish-yellow, the hair-bases are still black, but very inconspicuous compared with what they were in previous instar. The dorsal ridges are faintly marked in end view, and, on lateral view, each segment is raised and rounded, but flat compared with many Lycænid larvæ; two little white spots mark the eversible caruncles of the 8th abdominal segment. The slopes are upholstered remarkably, especially by an upper deep depression and a lower smaller one. The prothoracic plate is distinct, but not of a different colour; true legs dark, but not black. In the third (hybernating) instar there is a strength and consistence of hairs and hair-bases much beyond that of the two previous instars. There is some considerable variation in individuals, in the number and disposition of the hairs, as, for instance, on the 1st abdominal segment, across dorsum from spiracle to spiracle, there are 26 hairs and lenticles in one specimen and 29 in another. Again, in the second instar (on one specimen mounted) the posterior pair of large hairs only persisted, the others (anterior) being represented by lenticles. In this instar the opposite sides of the plate often differ, in one specimen the front (original) lenticle is absent on one side, but there is a short hair a little further back. In another there are the two front lenticles, behind these a pair of small hairs, and then a pair of large lenticles; from their position these rather represent the anterior pair of long hairs, the posterior being quite obsolete, and the two small hairs being a new appearance; there is also a short hair close to the special hair on one side, nothing on the other to correspond. In another, one front lenticle is wanting, then there is a pair of short hairs with a lenticle between them, and a second further back (taking these to be a pair, they are quite twisted out of correspondence), then a pair of large lenticles. The honey-gland is marked, and has marginal lenticles and short hairs, but of no special structure. The position of the caruncles (fans) of the 8th abdominal segment is obvious, but their structure not ascertained; these fans are so delicate that no specimen, preserved without reference to them, shows much, and even when an attempt is made to demonstrate them, it is usually very unsuccessful, obvious as they are when the living larva displays them. In another specimen, more nearly normal, are the two front lenticles (not quite symmetrical), two short hairs, and two large lenticles, and a short hair close to the special hair on one side only. In this specimen the honey-gland is marked by a special pair of lenticles and several others, the usual allowance for an abdominal segment being four or five near the spiracle, and only one pair near the dorsum. The hair-bases have decided coronal spines, and the hairs have very few, but fairly large, spicules. Many of the smaller hairs are scimitar-shaped, with spicules on the convex side and towards the apex. The coronal spines are less marked in the lenticles. One or two fine hairs at the bases of the prolegs have very fine and very numerous spicules, giving a different character to them. The spiracles are raised, pork-pie shaped, and are of very elaborate structure, including apparently rings of minute raised dots on the outer surface. The pads of the prolegs possess each one large and two small hooks. *Fourth* (penultimate) *instar* (April 20th, 1908): Still faintly greenish-white, skin with black skin-points; no markings; 6mm. long, 1·2mm. high, 1·5mm. wide; the prothorax looks dark from black head buried in its interior; a good crest of hairs down each side of back (dorsal flanges), and down each margin (lateral flanges), with a lower set down the middle of the slope; the eversible organs of the 8th abdominal segment appear as small white circles. By April 27th, 1908, it is of an uniform green colour, hardly interfered with by the subdorsal lines, the oblique stripes of a faintly lighter tone, and the black points of hair-bases; it is very flat, and perhaps looks flatter than it is; it has a marginal flange, and convex upper and under surfaces; its width is 2mm., which it carries nearly from end to end; its greatest height is 2mm., but this falls away very much on the 7th-10th abdominal segments. In the fourth (penultimate) instar, the hairs are relatively smaller, rather than larger, still many are 0·5mm. to 0·6mm. long, somewhat curved, thick; the spicules numerous, and regularly distributed. The coronal spicules on the bases are decided and acute, but so small that the half dozen or so round a base are well separated from each other. On the prothoracic plate are ten to fourteen hairs and lenticles, irregularly placed; each is surrounded by a row of beads, which are apparently skin-points, so to speak appropriated by the hair or lenticle, so that they look part of the base in some cases, almost separate skin-points in others; they, and the hair-bases and lenticles, are very dark; the plate which was hitherto dark is nearly colourless, except near the centre posteriorly, so that the little beaded circles stand out conspicuously. Except on the prothoracic plate, the skin-points are very transparent, and apparently of soft consistence. The honey-gland has a flight of lenticles, and also some short, thick, clubbed, and finely and closely spiculated, hairs, not seen in previous skins. The fans (collapsed of course) are very distinct. The pads of prolegs carry five or six hooks, of which two are long, the others variously shorter. One larva has both pads of one clasper with five hooks, the other has six on both. *Final instar:* 10mm. long, height 2·2mm., width 3·6mm.; of a pale green colour, with lighter lines along the dorsal flange, three lateral oblique lines, the lowest through spiracles faint, and a rather more evident lateral flange-line. On lateral view the segments are a little rounded, but less than in many larvæ, and with no approach to a humped or serrated outline. Seen on end there is a dorsal plain, and slopes nearly flat; the dorsal plain, about 0·8mm. broad, would hardly be noticed on end view but for the flange-hairs that mark it out. The hair-bases are smaller, and not so black as in previous skin, and so are less conspicuous; head black. Six days later, in somewhat sulky condition, 10mm. long, 4mm. wide, and 4mm. high, at 1st abdominal segment, sloping gradually backwards; it has a definite yellow, lateral line, and a dark dorsal line, which is, in fact, the dorsal vessel seen through very transparent tissues; the larva has generally a very transparent glassy look; it is of a vivid dark green, with a general effect of being a pale yellowish-green, owing to pale markings that have the appearance of being yellow lines of tissues some way beneath the surface. There are dorsal flange-lines and two oblique lines at equal spaces below this, leaving rather wider space below. Each segment has a depression below the dorsal line, and another in the spiracular region; these cause rounded surfaces that reflect light so as to much confuse attempts to make out either markings or contour; the hairs are inconspicuous, as already described. When nearly done feeding the larva acquires a yellower tinge for pupation. Head black, true legs

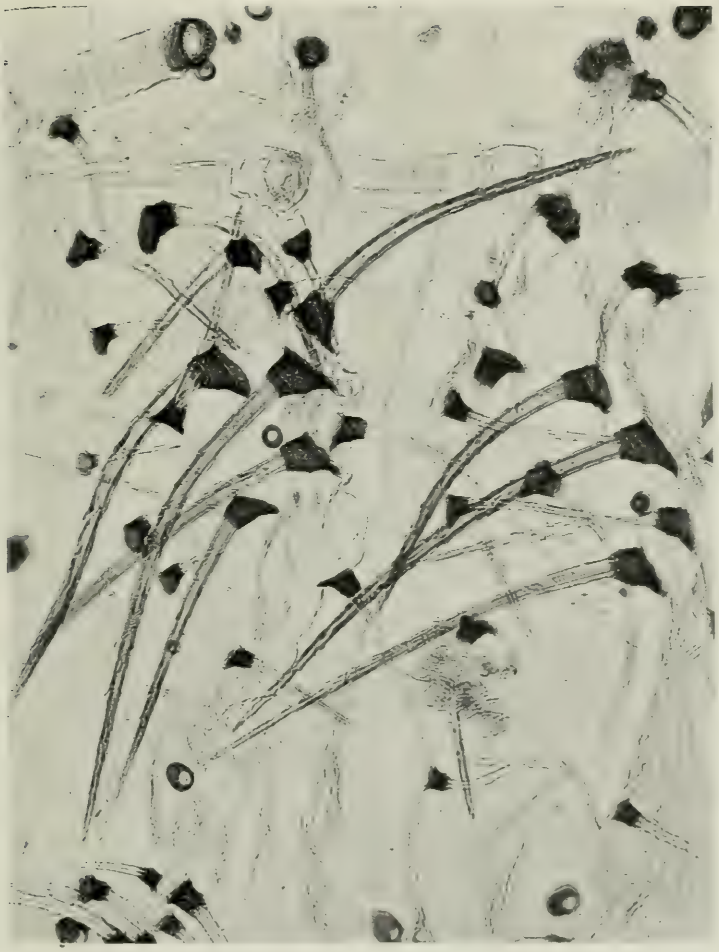

Photo. **F.** N. Clark.

HAIRS BELOW 3RD ABDOMINAL SPIRACLE OF LARVA OF CYANIRIS SEMIARGUS, PENULTIMATE INSTAR × 100.

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[*To face p. 292.*]

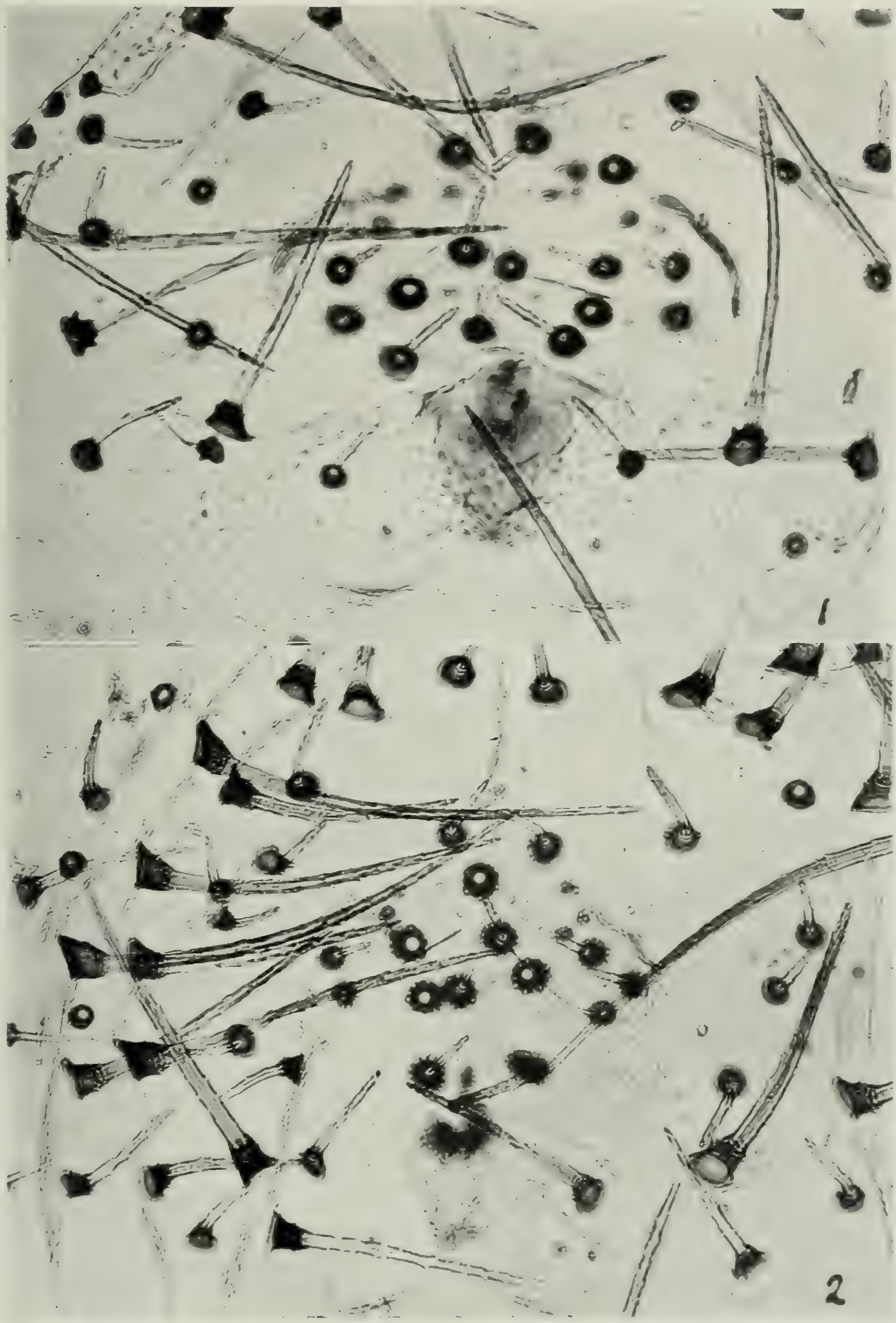

Photo. F. N. Clark.

Larval structure of Cyaniris semiargus.

1. Prothoracic plate, penultimate instar × 150.

2. Prothoracic plate, penultimate instar (different specimen). showing hair-bases well (those on disc of prothoracic plate approximating in structure to those of special hairs at angles of plate × 100.

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dark, hardly black; no yellow except that deeply sunk in larva. At rest it shows the upper surface of prothorax nearly level or parallel with the lower surface, and well below the slightly overhanging mesothorax, the head being quite retracted. The lower flange shows quite a fan of hairs (? those of tubercle vi) above prolegs, on 3rd-6th abdominal segments, less marked on other segments. The transparency of skin is very notable. Dorsa of segments rounded at flange. Larva looks flatter than it is, but is so in latter segments. The honey-gland is an oval patch without hairs or lenticles, *i.e.*, as if it were permanently a little open. The fans on the 8th abdominal are difficult to find on the older larva, and show only an impressed point, hardly visible; on the younger they are each a pale circle, somewhat conspicuous. In the older larva this conspicuous area is retracted. As part of its change for spinning up (?) the larva is very transparent, especially laterally, and looks as if it contained a yellowish mass centrally, with lateral processes (the oblique lines) (Chapman).

Foodplants.—*Trifolium pratensis* (Brabant, Chapman), *Anthyllis vulneraria* (Assmuss, Frey, Rothke, Paul and Plötz, Löffler, etc.), flower-heads of *Armeria vulgaris* (Zeller, Frey), *Melilotus officinalis* (Schneider, Kranz), prefers the seedpods of *Melilotus* and *Anthyllis*, probably also on *Cytisus sagittalis* and *Lotus corniculatus* (Höfner). [*Statice armeria* (Laplace) ? miscopied for *Armeria vulgaris*.] *Ulex europaeus*, in confinement (Frohawk). [The remark by Breit (*Soc. Ent.*, xiv., p. 99), that the eggs are laid on *Scabiosa succisa* and other low plants, is perhaps hardly worthy of notice.]

Puparium.—In confinement the larva, noted as the more forward (*anteà* pp. 284-5), spun a few vague threads, that were certainly not a girth, and were less than an apology for a cocoon; the larval skin fell free, and the pupa remained *in sitû*, but became loose by merely moving the box in which it was; still it had a slight hold by some cremastral structure to which some threads still adhere, and there are some very definite hooks at the end of the 9th and 10th abdominal segments. The larva noted as the less forward (*anteà* pp. 284-5), which was apparently a stronger and more healthy one, being larger and pupating a little later (both produced ♀ imagines), fastened itself within a few vague threads by a girth and cremaster to a portion of filter paper (used to keep food moist); the girth consists of very few threads, being very slight, and passes from points opposite the middle of mesothorax and somewhat backwards so as to cross the front margin of the 6th abdominal segment. After emergence, this girth retained the pupa in position, although the hold of the cremaster had given way (Chapman). The full-fed larvæ of the summer brood kept in confinement in a flower-pot filled with earth, in which red-clover plants were growing, at the commencement of July, sought out a suitable spot where the surface of the earth met the upright wall of the flowerpot, and here spun some silken threads, from the side of the pot to the nearest clover leaves, holding down the latter, and changing to pupæ in the little cocoons thus formed. The pupal stage, in 1886, lasted 17 days, July 7th-24th, at Cambrai (Brabant). The larvæ spin up, in confinement, on different parts of the plant, on stems, leaves, and flowers; in each case a very slight cocoon was formed by a few strands of silk, the larva being attached by the anal claspers to a pad of silk, and a cincture passed round the middle; the pupa is, therefore, attached to the foodplant by the cremastral hooks, by the cincture round the waist, and a few strands of silk spun round it, forming a slight cocoon (Frohawk).

Maturation of pupa.—Directly after pupation, the chrysalis is green, transparent, and one can still see the green dorsal line and the segmental incisions ; the head is distinctly reddish ; the thorax is very convex, and separated from the abdomen which is also strongly convex, by a depression. The green tint slowly fades, and after some days becomes pale yellow, whilst two days before the emergence of the imago, the pupa becomes entirely black (Brabant). When freshly changed, the colour of the pupa is of a clear transparent green,* showing the nervures of both the fore- and hindwings, and the general internal structure ; it gradually assumes an ochreous tinge at both ends, and the darker dorsal vessel can be seen pulsating as in the larva. When four days old it is mostly of a dull ochreous-green ; the thorax whitish-green, the head and anal segment pale pinkish-buff ; the neuration of both wings still showing. When nine days old, and mature, the colour is of a pale ochreous-green ; the wings palest, inclining to whitish ; the head, prothorax, and anal extremity, tinged with rust-red, caused by the density of the reticulations and discs ; spiracles whitish ; nervures still showing under the thin pupal skin. On the twelfth day the maturing of the imago commences by the eyes becoming a pale reddish-drab, and the wings opaque cream-colour ; the eyes daily deepen, and wings become paler and more opaque. On the fifteenth day the eyes are dark brown ; the wings, thorax, and head light tawny-buff ; the abdomen greenish-ochreous. On the following day, the whole colour is quickly transformed into black, blue, and grey. In the males the wings are then rich deep metallic-blue at the base, blending into light greenish-blue, forming the median area ; the rest of the wing black, and black nervures crossing the blue ; outer border creamy-white ; the eyes, thorax, and dorsal half of abdomen steel-black ; ventral surface olive. A few hours before emerging, the blue of the wings assumes a silvery-grey, and all the hair-scales of the body show clearly through the thin delicate texture of the pupal skin, giving the whole a silvery-grey appearance.

Pupa.—The pupa looks naked, but there are a few hairs with extremely fine spiculations ; the hairs are about 0·06mm. or 0·07mm. long. It is 10·4mm. long, 3·4mm. wide at wing-bases, 2mm. from the front, and 4·2mm. at the 4th abdominal segment, 7mm. from the front. The summit of the mesothorax (2·7mm. from front) is 3·5mm. high, and after a waist at 4mm. from the front, the dorsum rises to 4·2mm. over the 2nd, 3rd, and 4th abdominal segments, just appreciably highest over the 3rd abdominal. From the end of the wings, 7·7mm. from the front, the extremity is rounded, most on back, but also slightly in front, the anal extremity being raised, not curved ventrad, as in that of *P. argus* (*aegon*). The colour is green, pale, with a definite olive tint, and laterally and ventrally on the abdomen, has a brownish tone as from overlying pink or purple. The dorsal line is slightly darker, with a purple tone, and there is another line of the

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* Frohawk observes that a larva which fed entirely on furze-blossoms after hybernation remained a much paler colour, being of a pale, greenish, yellow-ochreous tint, whilst the pupa was likewise pale in colour.

PLATE XLI.

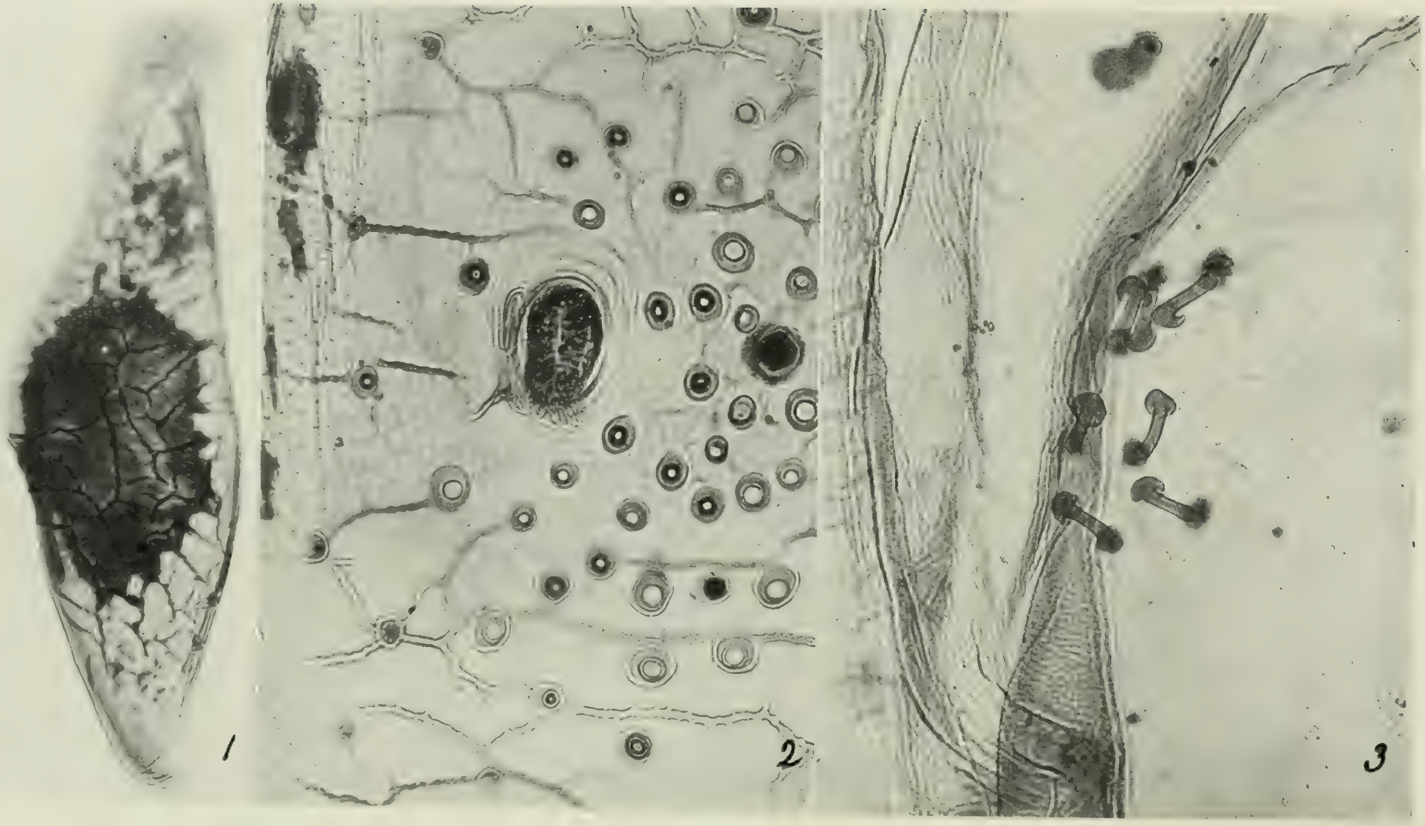

Photo. F. N. Clark.

Pupal structure of Cyaniris semiargus.

1. Dorsal headpiece (from a pupa with dark markings) × 85. 2. Fifth abdominal spiracle, left side [incision 4-5, flight of lenticles, and rosettes (to left side) shown] × 125. 3. Cremastral area (anchor-hooks of one side of ventral set only shown) × 125.

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same tint rather nearer spiracle than half-way from dorsum. The wings are very transparent, the glazed eye definitely darker (May 18th, 1908). A second pupa was somewhat larger than this. There is a difference between the two empty pupal skins, *viz.*, that the one described above shows various dark markings, that were not noted in the living pupa, and from which the second is now quite free. [The above description was made, however, and the pupæ left possibly, before they were really mature, so that the dark marks probably arose later; both pupæ afforded well-developed butterflies, so that the marks are probably not pathological. The examination of more pupæ is desirable to clear up this variation.] The second pupa is uniformly tinted, very pale brownish-ochreous, and is very smooth, the wings polished, and no trace of hairs, with a hand lens. The markings on the other pupa are blackish-brown and consist of a spot on the dorsal head-piece, a line along the front border of the prothorax, a few dots on mesothoracic dorsum, a heavy line across wing-spine, a series of spots and dots across end of wings, a few dots on abdomen, some spots on appendages, especially a patch towards the end of the antennæ, all these nearly, if not quite symmetrical on the two sides. The cremaster is very weak, from the small number of hooks, which are, however, fairly well-developed; there are eight or nine hooks on the dorsal patch, and six on one side, and seven on the other of the divided ventral patch (all on 10th abdominal ?); the hooks are of the usual anchor shape, are very short and thick, and the head heavy and round, with the two oblique points very sharp and somewhat curved, each hook about 0·06mm. long. The pupal skin is thin and delicate, and covered by a network of very slender, raised lines, which, except on the appendages, have the minute rosettes very sparsely scattered on their intersections; the rosettes are like small round buttons, with a central point. There are a good many hairs, short, 0·05mm. to 0·10mm. long, rather thick and coarsely spiculated on the prothorax, seven to ten on each side, more towards the outer angles, where lenticles are abundant; there are six on one side of the mesothorax, one on the metathorax; two to four on the dorsa of the abdominal segments, and one or two (or even three) close to nearly each spiracle, where also lenticles are plentiful. A lenticle is visible on each leg at (approximately) the tibio-tarsal joint. The cover of the prothoracic spiracle (about 0·1mm. long) has the usual compound fungus-hair structure. The first leg is very short and broad (basally) 0·3mm. broad, 0·7mm. long; the second, 0·11mm. by 0·9mm. There is but a shallow pocket for the end of the maxillæ, in the 4-5 incision, noticed in the pupæ of *Plebeius argus* and other Lycænids (Chapman). Averages $\frac{5}{12}$ins. in length. *Dorsal view:* The head is obtuse; from the base to middle of wing the outline is straight, then swelling to the 2nd and 3rd abdominal segments; the abdomen attenuated to the rounded anal segment. *Lateral view:* The head rounded, with slight swellings at base of antennæ; thorax convex; division between 1st and 2nd segments forming an obtuse angle; abdomen slightly swollen, and curving to rounded anal segment; the ventral surface forms almost a straight line (in which respect it mainly differs from the pupa of *Lycaena arion*). The cremastral hooks number in all 24, and are placed in two distinct patches of 12 each. The entire surface (like that of *L. arion*) is covered with very fine brown reticulations, and, excepting the wing, is sprinkled also with minute circular discs; these are especially numerous on the head and prothorax; also sprinkled over the surface are finely serrated whitish bristles. On each side of the prothorax, is a small patch of bristles with their ends finely ciliated. The dorsal gland of the larva is modified into a slight suture, marked in the centre by a brown spot (Frohawk).

Time of appearance.—This species, now practically extinct in the British Islands, was evidently formerly double-brooded with us. The earliest recorded capture of the species was the taking of examples the last week of August, 1793 (Lewin); by 1803, Haworth had evidence of its occurrence in mid-May and again at the end of July. These times are repeated by Samouelle, who gives the "middle of May" and the "end of July." Stephens and Curtis give "end of May and July," yet Bree (*Mag. Nat. Hist.*, vi., p. 190) gives June 28th, 1804, and July 15th, 1812, as dates on which he took single worn and faded ♀ s. In North France, the species is distinctly double-brooded, the species having been several times bred in Cambrai, the first brood from hybernated larvæ in late May and early June, the second brood at the end of July and early August (the pupal stage lasting about seventeen days), in 1886, emerging from July 24th, coming from chrysalids that had pupated from July 7th. We have no doubt that this is so throughout France, for, at Grésy-sur-Aix, the second brood appears to emerge just about this time (July 25th-26th, 1896, July 26th, 1898, but August 18th-20th, in 1900, which might have been a late second, or a partial third, brood); whilst still further south, at Digne, the species is out in May and early June, and again in July-August (Tutt); the following are also recorded —May and July in Calvados (Fauvel); May and August in Eure (Dupont); May-June, and July-August, in Haute-Marne (Frionnet); May 15th-June 15th, in Indre, July 25th, in Cantal, and August 10th, in Puy-de-Dôme (Sand); May and July, in the Bouches-du-Rhône (Siépi); in May, in the Alpes-Maritimes (Millière); and in July, at Nice (Lang), etc. It is also recorded as appearing in May in Corsica (Mann). In Belgium it is reported to occur at the end of May into early June, and again in July-August (Lambillion). In the Netherlands, it is reported for May, and again in July (Snellen). In Germany the evidence goes to show that the species is double-brooded, or partially double-brooded in the lowlying parts; although possibly the number of double-brooded examples is much fewer in the north than in the south. It is recorded as occurring from mid-June (12th) to August (1st), in East and West Prussia (Schmidt); in May-June, in Silesia (Döring); and July, near Grafenberg (Neustädt); in May, and again in July-August, on the Görlitz Heath (Marschner); everywhere in two broods, in the Sprottau district (Pfitzner), but from May to July, in the mountains of Upper Lusatia (Sommer); occasionally at end of May, but chiefly in June and July, and still out at the beginning of August, in Waldeck (Speyer); in May, and again at the end of July and in August in the Rhine Provinces (Rothke, Weymer), and in Brandenburg (Nürnberg), May 31st, 1905, at Niederneundorf (Dadd); from May to September at Hanau, in Hesse (Limpert and Röttelberg), in May and June (Koch), and June to September (Dickoré), at Frankfort-on-Main; June, in the Taunus mountains (Rössler), but fresh specimens were captured May 18th, and July 29th, 1881, at Bornich, in the Taunus, evidently representing two broods (Fuchs); also early August at Wiesbaden, and in mid-August, 1900, at Braunfels (Sich); June, near Cassel (Borgmann), but July to August, at Rotenburg-on-Fulda (Jordan); May-June and September, in Pomerania (Paul and Plötz); in two broods (Spormann); occurs throughout the whole summer in Posen (Schultz); double-brooded in June, and again in August, in Thuringia (Krieghoff); in May, and July-August, at Zeitz-on-Elster (Wilde); worn, mid-July, on the Veronikaberg (Gillmer); in the Kingdom of Saxony, in May-June and July-August, at Dresden (Steinert); June-July, in Saxon Upper Lusatia (Schütze); in Baden, May and beginning of July (Meess and Spuler); locally abundant towards the end of May, 1906, near Lahr (Keynes); occurs in May and August, in Hamburg (Zimmermann and Laplace) [early specimens not observed in the province after seven years' collecting (Gillmer)]; worn, end of July, on Sylt Island (Werneburg); in June and August, at Schwerin, in Mecklenburg (Voelschow), June to August, at Eutin (Dahl); July, near Friedland (Stange); as late as September, 1896, on the Kiebitzberg, near Waren (Busack); occurs in May, and again in July and August, in the Province of Saxony (*Ent. Ver. Erfurt*); early June, in Anhalt (Stange); from June to August, at Dessau (Richter). Gillmer states that "although *C. semiargus* occurs from the end of June until August, in Anhalt, he believes there is only one brood, and that he cannot confirm Heinemann's statement that it has two broods in Anhalt, nor Fischer's that it occurs in spring and summer at Wernigerode." Reinecke gives May-June, and August, for the north-eastern border of the Hartz, and Jordan gives end of May and mid-July, at Göttingen. In Switzerland the species is well out in mid-May, in the warmer parts of the Valais and Geneva, and apparently again in mid-July; it is particularly abundant in the Geneva district in May and June, but the second brood appears to be a very partial one; in the mountains it rarely appears until mid-June, and, according to elevation, continues to appear until towards the end of July or even the beginning of August, but only in one brood. In a very early year, 1897, the first brood was abundant between April 6th-21st, at Veytaux, and, in 1899, between May 1st-5th, and, in this latter year, the second brood was practically over in mid-July, at Aigle, and over a series of years it may be considered as proved that, in the hotter, lowlying parts of Switzerland, the first brood is always well out in May, and the second brood from early July to August; Reverdin states that, near Geneva, May-early June is the time for the first brood, and end of July-August for the second brood. In Italy it is also double-brooded, occurring at the end of May and in June, and also in July and August in Tuscany (Stefanelli), in May and June on the hills by Brianza, and in September near Alzate (Turati); well out in mid-May, in Piedmont at Orta, Locarno, and Lugano (Lowe), a second brood no doubt being represented by specimens captured July 8th-10th, at Chiesa (Rowland-Brown), in August, at Aosta (Tutt), and in July, at Certosa di Pesio (Norris); in the mountains, as in Switzerland, it is single-brooded, occurring in July and August, *e.g.*, at Courmayeur, Cogne, etc. In Portugal, there is no record of a second brood, but the first brood is worn in early June (Eaton). In Spain, the species appears to be little known, but one suspects again that it is double-brooded except at considerable elevations—mid-May, at Granada, end of July, at Bejar, mid-July, at Moncayo (Chapman), in August, in Teruel (Zapater), mid-July at La Granja (Sheldon), end of June, near Barcelona (Witty), suggest distinctly two broods. The various records in Austria also suggest double-broodedness, *e.g.*, May-June and July-August, in Upper Austria (Himsl); May-June (Fritsch), and July (Rossi), in Lower Austria; June, and again in August, in the plains about Salzburg (Richter); in May, and July-August, in Bohemia (Nickerl); early May and July, in Moravia (Schneider); as early as May 28th, at Bregenz, and June 8th, at Innsbruck (Fritsch), but single-brooded in July-August, in the Tyrolean Alps (Tutt); in May-June, and July-August, in the lowlands of Carinthia, but single-brooded in July-August, in the mountains (Höfner); in June, in Carniola, and in the Dobrudscha (Mann), whence a second brood has not been recorded. In Hungary, mid-May and mid-July, abundant (Aigner-Abafi). In Bulgaria, it occurs in May and early June, but at the end of June at Slivno, and in late June in the Rilo mountains (Nicholl). In Bosnia and Hercegovina, in June and July (Nicholl), but the specimens were largely captured in the mountains, where the species may be only single-brooded. In Roumania, it occurs in May (27th)-June, and then singly only in August (Caradja). In Turkey and Greece the first brood is very early, April 20th-May 26th, on Mount Parnassus (Staudinger), nearly over on May 2nd 1879, near Gallipoli (Mathew), also in May, 1900, round Kalávryta (Fountaine); so few collectors, however, work here, that a second brood has not been recorded. In Syria, the species was fully out near Ain Zahalta in April, 1901 (Fountaine); whilst, in 1905, it appeared from June 1st-4th, above the same place at an elevation of 6500ft (Graves). In Asia Minor, it occurred between April 17th and May 20th, at Broussa, also in July, at Tokat, distinctly suggesting two broods (Fountaine); in Cilicia, it occurred in early May, near Tschekor Köslü, but not before June at Gözna, at a height of 1000m. (Holtz). In the north of Europe the species appears to be single-brooded, *e.g.*, it occurs from June to August in Scandinavia (Wallengren), and appears almost through the summer in Finland, but more especially in July (Federley); in the Baltic Provinces it is also apparently single-brooded from June (8th) into July (Nolcken); in the Wiatka Government in June and July (Kroulikowsky), whilst in the provinces Casan and Orenburg, May, June, and July are recorded (Eversmann). Collecting throughout the greater part of Asia has been of the most desultory character, but we notice—throughout June in Persia (Christoph); in May in the Upper Irtish valley (Lederer); May and June in the Pamir, and June in the Thian-Shan (Grum-Grshimailo); end of July in the Altai (Elwes); June, in the Ala Tau, near Lepsa (Haberhauer); June, in the Lower Ussuri (Bremer); June, in the Kounguesse mountains, at 7000ft. (Alphéraky). The following dates will enable students to understand the great differences in the times of appearance of this species in different parts of its range, and at different altitudes—June 30th, 1846, on Mount Etna (Zeller); June 28th, 1855, at Borbi (Schrenk); June 22nd, August 1st, 1861, worn, in Sylt Island (Werneburg); July 4th, 1865, in the Usthal, between Usingen and Ziegenberg (Fuchs); April 20th-May 26th, 1869, on Mount Parnassus (Staudinger); June 7th, 1870, at Hadscyabad (Christoph); June 28th-July 3rd, 1872, at Lucca (Walker); August 15th, 1872, on the Furka Pass (Lang); June 24th, 1878, at Shahkuh (Christoph); June 28th-July 5th, 1878, on the Riffelberg (Jordan); July 8th, 1878, in the Val

Fex, between 5500ft. and 8500ft. (Elwes); May 2nd, 1879, a few specimens, all ♀s, on the cliffs at Port Baklar, about 12 miles from Gallipoli (Mathew); June 22nd-July 11th, 1879, at Briançon and Oulx (Forbes); June 5th, 1880, near São Romão (Eaton); May 18th and July 29th, 1881, near Börnich, in the Taunus mountains (Fuchs); June 25th-July 2nd, 1883, near Carlsbad (Becher); July, 1884, and July, 1885, at Lucerne (Lemann); June 15th, 1886, at Andermatt (Jones); imagines emerged from July 24th, 1886, from pupæ that had changed July 7th onwards, at Cambrai (Brabant); May 30th, 1887, at Lugano (A. H. Jones); June 29th-July 11th, 1887, at Vernet, July 12th-19th, 1887, at Bagnères de Luchon, July 20th, 1887, at St. Sauveur (Elwes); July 26th, 1887, in the Maderaner-Thal (Lang); July 16th, 1887, at Zermatt (Blachier); June 20th-21st, 1888, at Wiesbaden (Prideaux); June 7th, 1889, at Yir Madaus, Thian-shan (Grum-Grshimailo); June 6th-18th, 1890, at Digne (Lemann); June 5th-20th, 1890, on the elevated ground of Les Dourbes (A. H. Jones); June 26th-July 6th, 1890, at Engelberg, July 9th-15th, 1890, at Engstlen (Baker); July 24th, 1890, at Bérisal (Blachier); July 18th-29th, 1891, at Digne (Lemann); June 1st-15th, 1892, near Czernowitz (Hormuzaki); June and July, 1892, at Certosa di Pesio (Norris); June, 1892, at Budapest (Lemann); June 8th-21st, 1893, in the Wolfsthal (Nicholson); June 12th, 1894, at Bisbinno (Knecht); July, 1894, at Vernet (Lemann); July 30th-August 6th, 1894, at Courmayeur, August 2nd, 1894, on the Mont de la Saxe, August 16th, 1894, in the Cogne Valley, August 18th, 1894, at Aosta (Tutt); August 1st-15th, 1894, at Saas-Fée, Saas-Grund, Mattmark, etc. (Rowland-Brown); May 25th-29th, 1895, at Grupont (Bath); July 18th-22nd, 1895, at Campiglio (Lemann); July 20th, 1895, at Divonne (Reverdin); July 26th-August 2nd, 1895, at Mendel Pass (Tutt); August 24th, 1895, on the Oberalp (Chapman); June 15th and June 28th, 1896, in the Buchenau (Himsl); June, 1896, a single ♂ at Zafferia, near Messina (Fountaine); July, 1896, at Göschenen, Brünnen, and Andermatt (Tutt coll.); July 13th, 14th, 1896, on the Veronikaberg (Gillmer); July 20th-August 5th, 1896, at Gavarnie and Héas (Bath); July 25th-26th, 1896, at Grésy-sur-Aix, July 30th-August 5th, 1896, at le Lautaret (Tutt); August 2nd, 1896, under the Col de Jaman, August 10th-12th, 1896, at Evolène and Arolla (Rowland-Brown); April 6th-21st, 1897, at Veytaux, August 6th, 1897, at Bérisal (Wheeler); July 2nd, 1897, at le Sepéy, July 13th, 1897, at Kandersteg (Lowe); July 13th-20th, 1897, in the Lena dist. (Herz); July 15th-21st, 1897, at Wolfsberg, August 1st, 1897, at Innsbruck (Lemann); July 29th-August 4th, 1897, at St. Michel de Maurienne (Tutt); July 30th, 1897, at Bérisal, August 3rd-10th, at Saas-Fée, August 20th-30th, 1897, at Gruyères (Rowland-Brown); June 8th-9th, 1898, at Jablonica, June 22nd, 1898, on the Vlasic Planina, near Travnik (Nicholl); June 20th-July 2nd, 1898, at Saeterstoen (Chapman); August 4th-10th, 1898, at St. Laurent (Rowland-Brown); July 8th-August 30th, 1898, at Bérisal (Wheeler); July 23rd, 1898, at Zermatt (Lowe); July 26th-30th, 1898, in the Bashkaus Valley, from 3000ft.-6000ft. (Elwes); July 26th, 1898, at Grésy-sur-Aix, August 14th, 1898, in the Val Véni (Tutt); July 28th, 1898, at Ongodai, from 3000ft.-5000ft. (Jacobson); July 31st, 1898, at Zinal (Rowland-Brown); August 2nd, 1898, on Mont

Tendre, August 18th, 1898, on the turf-moor of Sentier (Mory); May 1st-5th, 1899, at Veytaux (Wheeler); May 21st, 1899, on the Vitoch, May 29th, 1899, west of Slivno, June 8th, 12th-26th, 1899, in the Rilska valley, June 18th, 1899, in the Struma Valley, June 30th, 1899, at Samakov (Nicholl); June 4th-9th, 1899, at Digne, June 21st-30th, 1899, at Susa (Rowland-Brown); June 18th-23rd, 1899, at Digne, June 28th-July 7th, 1899, at St. Martin Vésubie, common, July 9th-14th, 1899, in Corsica, July 25th, 1899, at Nice (Lang); July 1st-8th, 1899, at Visp, July 3rd, 1899, worn, July 7th, 1899, quite fresh at St. Niklaus, between July 9th-11th, 1899, at Kandersteg, July 12th-13th, 1899, at Aigle (Rosa); July 1st-12th, 1899, at Fusio (Chapman); July 15th-August 25th, 1899, in the Brenner district (Galvagni); July 28th, 1899, on the Simplon, August 4th, 1899, from Useigne to Evolène, August 4th-12th, 1899, at Evolène, August 12th, 1899, on the Bricolla Alp (Tutt); August 26th-September 4th, 1899, near Weggis (Sanford); May 15th-17th, 1900, in Morea (Elwes); May, 1900, round Kalávryta (Fountaine); May 12th-June 16th, 1900, at Orta, June 6th, 1900, in the Val Anzasca, very abundant and fine, June 11th, 1900, in theVal Strona (Lowe); May 14th, 1900, at Beit Chabab, May 17th, 19th, June 14th-17th, 1900, on the Djebel Sunnin, May 20th-26th, 1900, on the Djebel Keneyseh, May 21st, 1900, at the Cedars of Lebanon (Nicholl); June 18th-28th, 1900, at Saeterstoen (Morton); June 21st-25th, 1900, at Salzburg, June 26th-28th, 1900, at Berchtesgaden, June 29th-July 2nd, 1900, at Mödling (Lang); June 23rd, 24th, 1900, on Mont Sény, near Barcelona (Witty); July 1st-20th, 1900, at Pontresina, July 21st-30th, 1900, at Guarda (Chapman); July 5th-6th, 1900, between Thusis, Splugen, and Chiavenna, July 8th-10th, 1900, at Chiesa, July 13th-16th, at Trafoi, July 19th-26th, at Cortina, July 26th-30th, 1900, at Brenner, the commonest blue (Rowland-Brown); very abundant at Cortina, July 18th-26th, 1900 (A. H. Jones); July 18th-21st, 1900, on the Simplon Pass (Rosa); July 21st-August 9th, 1900, in the Brenner district (Galvagni); July 31st-August 8th, 1900, at Wiesbaden, August 10th, onwards, at Braunfels (Sich); July 29th, 1900, at Larche, August 9th and 16th, 1900, at Abriès, August 12th, 1900, on the Crête de Reychasse, August 18th-20th, 1900, at Grésy-sur-Aix (Tutt); July 29th, 1900, at Leuk (Reverdin); August 2nd-5th, 1900, in the Blumenthal (Wheeler); May 18th-20th, 1901, at Granada (Nicholl); June 4th, 1901, at Rindomo, in the Taygetos mountains (Holtz); June 20th-25th, 1901, at Bozen, June 28th, 1901, at Brenner, July 2nd, 1901, at Innsbruck (Lowe); July, 1901, at Zermatt (Lemann); July 16th-29th, 1901, at Florac, Mende, etc. (Rowland-Brown); August 17th, 1901, above Bérisal (Keynes); May 14th, 1902, and following days at Locarno, July, 1902, on the Sierra de Bejar (Chapman); May 27th, 1902, in the Gorge du Chaudron (Barraud); June 18th, 1902, above Sta. Maria, on the Cenis Rd., June 23rd-28th, 1902, at Certosa di Pesio, common, July 1st-10th, 1902, at Courmayeur, July 17th, 1902, at Brenner (Lowe); June 24th, 1902, at Chatel (Tutt coll.); June 26th-July 17th, 1902, at Sireosen (Strand); June 27th, 1902, at Vernayaz, July 6th, 1902, near Bérisal (Sheldon); June 27th-30th, 1902, above St. Georges, September 2nd, 1902, near Sonzier (Wheeler); July 1st, 1902, at Admont (Blachier); July 5th-20th, 1902, near Villars, July 28th-30th, 1902, at Zermatt (Moss); July 28th, 1902, at Chavoire, August 5th-11th, 1902, at Megève, August 18th, 1902, on the Brévent, August 14th-16th, 1902, at Lavancher (Tutt); April 17th-May 20th, 1903, near Broussa, one at Amasia, in June, and a few near Tokat in July, 1903 (Fountaine); May 26th, 1903, at Les Avants, August 8th, 1903, at Champéry (Wheeler); May 21st and August 31st, 1903, at Chambésy, June 7th, 1903, on the Grand Salève, July 21st-28th, 1903, in the Laquinthal, August 8th, 1903, at Zinal, September 21st, 1903, on the Petit Salève (Reverdin); May 30th, 1903, near Aigle, July 4th, 1903, at Suan, above Corbeyrier (Sloper); rare in June, 1903, at Frameries (Derenne); July 10th-19th, 1903, at Trafoi, July 20th, 1903, at Bozen (Lowe); June 23rd-24th, 1903, between Göschenen and Wassen (Keynes); June 25th, 1903, in the Tinière Valley (Tutt coll.); July, 1903, on the Simplon Pass (Lemann); July 14th, 1903, in the Laquinthal (A. H. Jones); July 14th-19th, 1903, at Moncayo (Chapman); July 15th, 1903, at Fionnay, Vallée de Bagnes, July 20th, 1903, in the Saas-Thal (Blachier); July 20th, 1903, on the Simplon Pass (Tutt coll.); July 22nd, 1903, worn, in the Schlossgarten at Schwerin (Busack); July 29th, 1903, above St. Martin Vésubie (Rowland-Brown); July 27th-28th, 1903, in the Laquinthal (Sheldon); July 27th, 1903, at Roche, near Aigle, July 29th, 1903, Haudères to Satarme, July 29th-August 11th, 1903, at Arolla (Tutt); May 10th, 1904, at Geneva, July 21st, 1904, on the Col Ferret (Muschamp); May 12th, 1904, at Chambésy, August 8th, 1904, at Almagel (Reverdin); May 18th, 1904, at Hagia Lavrá (Holtz); June 19th, 23rd, 1904, at Macolin, June 20th, 1904, at Tramelan, early July, 1904, at Samaden, July 2nd, 1904, at Grindelwald (Lowe); July, 1904, at Brenner (Lemann); very common early July, 1904, at Virton, rare in June, 1904, at Frameries (Derenne); July 12th, 1904, at Brenner, July 21st-27th, 1904, at Campiglio (Rowland-Brown); July 25th, 1904, fine, in the Schlossgarten at Schwerin (Busack); July 30th, 1904, on the Oberalp Pass, August 15th, 1904, on the Alp Arpitetta, near Zinal (Wheeler); August 1st, 1904, at the foot of the Grand Salève (Tutt); August 20th, 1904, near Guînes (Gurney); May 11th, 1905, at Chambésy, May 28th, 1905, in the Bois-des-Frères, June 8th, 1905, on the Grand Salève, June 25th, 1905, on the Faucille (Reverdin); May 23rd, June 7th, 10th, 28th, 1905, at Geneva, June 8th, 1905, at Prevessin (Muschamp); May 31st, 1905, on the Jebel Barouk, June 1st-4th, 1905, above Ain Zahalta (Graves); May 31st, 1905, at Niederneundorf, June 26th, 1905, near Oberstdorf, June 27th, 1905, high up the Oythal, in the Allgau Alps, June 28th, 1905, on the lower slopes of the Seealp, mid-August, 1905, on the Glätzer Gebirge (Dadd); June 21st, 1905, at Caux, June 29th, at Loeche, July 3rd-8th, 1905, at Bérisal (Prideaux); June 21st, 1905, at Martigny, July 11th, August 8th, 1905, in the Val d'Antigorio, July 10th, 1905, at Le Vernet, July 30th, 1905, at Lac de Gaube, above Cauterets (Rowland-Brown); July 18th, 1905, in the Laquinthal (Blachier); June 22nd, 1905, near Loeche (Lowe); June 24th, 1905, between Sierre and Evolène (Pearson); June 27th, 1905, and onwards at Aigle (Gurney); June 29th-July 12th, 1905, in the Wengen district (Moss); July 12th, 1905, at Fusio (Lang); July 19th, 1905, near La Granja (Sheldon); July 21st, 1905 on the Gaisberg (Bentall); July 27th-August 1st, 1905, at Château d'Oex (Tetley); August 11th-14th, 1905, near the Kaltwasser Gallery, on the Simplon (Keynes); May 17th, 1906, at Digne (Blachier); May

28th, 1906, at Versoix, July 8th, 1906, at Schallberg, July 12th, 1906, at Simplon, July 17th-August 2nd, 1906, at Arolla, August 22nd, 1906, at Martigny (Reverdin); June 12th, 1906, at Caux, June 22nd, 1906, at Aarberg, July 5th and 6th, 1906, at Bérisal, July 9th, 1906, in the Laquinthal, July 13th, 1906, at Fusio, July 22nd, 1906, at Simplon Dorf (Lowe); June 16th, 1906, at Caux, June 17th, at Les Avants, June 19th, at Eclépens, June 28th-July 8th, 1906, at Bérisal (Prideaux); June 16th-July 8th, 1906, at Eclépens (Lowe); June 24th-29th, 1906, between Wassen and Göschenen (Pearson); June 27th, 1906, in the Wesen Marsh, July 15th, 1906, in the Suvretta Thal (Keynes); July 8th-26th, 1906, at Arosa (Jones); July 8th, 1906, at St. Martin Vésubie, July 12th, 1906, on the Simplon, July 25th, 1906, on the Dent du Midi (Muschamp); July 14th, 1906, in the Wörnitz, on the border of the Mosigkau Heath (Gillmer); July 30th-August 2nd, 1906, at Clelles, August 5th, 1906, at Digne, August 10th, 1906, in the Val d'Allos, August 14th, 1906, above the Lac d'Allos, August 16th, 1906, above Colmars (Tutt); May 14th, 1907, on the Dourbes Road, near Digne (Rowland-Brown); May 21st, 1907, in the Lavey Woods, May 24th, 1907, at St. Triphon, May 30th, 1907, at Sion, May 31st, 1907, near Sonciez (Tetley); June 4th, 1907, at Glion, June 5th, at Tinière, June 15th-18th, at Bérisal, June 16th, 1907, between the fourth and fifth refuges on the Simplon Pass (Prideaux); June 7th, 1907, at Glion, June 8th, 1907, in the Val Tinière, June 12th, 1907, at Martigny, June 17th, 1907, at Sierre, June, 18th, 1907, at Eclépens, June 25th, 1907, at Wesen, middle of July, 1907, at Pontresina and in the Heuthal (Lowe); June 16th, 1907, between Vernet and Casteil, June 25th, 1907, in the Vallée du Lys (Keynes); June 21st, 1907, at Herculesbad (Jones); June 26th, 1907, at Pain Sec (Pearson); July 5th-7th, 1907, at Martigny, July 8th, 1907, at Ganter, July 9th, 1907, at Gondo, July 10th, 11th, 1907, in the Laquinthal, July 12th, 1907, at Alpien, July 13th, 1907, on the Rossboden Alp (Rehfous); July 9th, 1907, at Iselle, July 12th, 1907, on the Alpien Alp, August 4th, 1907, at St. Cergues, August 13th, 1907, at Kienthal, August 14th, 1907, at Schynige Platte (Reverdin); July 9th-30th, 1907, at Gavarnie (Chapman); July 15th-30th, 1907, at Bérisal, Binn, etc. (Rowland-Brown); July 16th, 1907, at Airolo, July 29th, 1907, in the Laquinthal (Blachier); July 25th, 1907, on the Dent du Midi (Muschamp); July 29th, 1907, above Göschenen, July 31st, 1907, in the Göschenen Thal, August 3rd, 1907, at the entrance to the Val Tremola, August 4th, 1907, at Piotta, August 14th, 1907, in the Val Roseg, August 18th, 19th, 1907, near Weissenstein, August 23rd, 1907, in the Via Mala (Tutt); August 15th-22nd, 1907, at Evolène (Page); imagines emerged June 5th-7th, 1908, and on through the first half of June, from chrysalids obtained from larvæ that pupated May 19th, onwards; the larvæ came from ova laid July 5th-6th, 1907, by Vienna ♀s (Frohawk); June 22nd-July 15th, 1908, at La Granja (Lowe); June 28th, August 3rd, 1908, at St. Maurice-sur-Moselle, July 2nd, 1908, at Ballon d'Alsace, July 7th, 1908, at Le Tholy (Gibbs); June 29th, 1908, at Obersee, July 10th, 1908, at Campolungo, August 4th, 1908, at Glärnisch (Muschamp); July 5th, 1908, worn, above Salvan, July 17th, 1908, at Bérisal (Prideaux); July 8th, 1908, at Binn (Blachier); July 7th-17th, 1908, at Vissoye, August 9th-16th, 1908, at Zermatt (Chapman); July 13th and 29th, 1908, at Charmes, July 23rd, 1908, Luxeuil-les-Bains (Gibbs); July 17th, 1908, at Leuk, July 19th, 1908, at Martigny, July 20th-August 2nd, 1908, at Hermance (Reverdin); July 23rd, 1908, at Mühlau, July 18th, 1908, at Kalbling, August 4th, 1908, at Reichenstein (Kiefer); July 27th-30th, 1908, on the Staefa bog, August 4th, 1908, at Spinabad and Glaris, August 8th, 1908, on the Fluela Pass, August 9th-10th, 1908, between Lavin and Guarda, August 13th, 1908, on the lower slopes of the Wormser Joch, well above Santa Maria, August 14th, 1908, on the Ofen Pass, above Zernetz (Tutt); August 2nd, 1908, at Barcelonnette, August 7th-8th, 1908, at the Lac d'Allos (Rowland-Brown).

HISTORY OF CYANIRIS SEMIARGUS AS A BRITISH SPECIES.—The species is said to have been first noted by Moufet, in 1634, and described (*Insectorum sive Minimorum Animalium Theatrum*, p. 105, no. 3) by him as—

> Si volantem videris, alas purpurei exoleti coloris in cæruleum vivaceum abeuntes esse dixeris, variis plicis donatas; intus autem annulis oculeis præditæ, cæsiæ magis videntur atque aeruginosæ. Caput ex viridi cæruleum splendet; corpus fuscis albisque institis ornatur, oculi nigerrimi, pupillæ albissimæ videntur.

This description is not very conclusive. It was then described by Ray (*Historia Insectorum*, p. 132, no. 17), in 1710, as follows—

> *Papilio* minor, alis supinis purpuro-cæruleis, pronis ocellis aliquot pictis. An Diurnarum minimarum tertia Mouffeti, pag. 105? Alæ supinæ ab exortum cœrulescunt; inferiùs è fusco albicant. Ocelli sex septemve in singulis alis. A. D. Dale capta nobisque ostensa est.

It was described, in 1795, by Lewin (*Papilios of Great Britain*, p. 80), as—

> *Cimon*. The dark blue. This is a very rare butterfly with us, and, as may be readily supposed, our knowledge of its natural history is very confined. The caterpillar is unknown. The last week in August, 1793, I took two or three of the butterflies, flying in a pasture-field at the bottom of a hill near Bath. They were much wasted in colour, and appeared to have been long on the wing, so that it may be concluded that they were first out from the chrysalides about the middle of July. The upperside is represented at fig. 7, the underside at fig. 6.

Haworth, in 1803, describes it (*Lep. Brit.*, p. 48) under the name of "*P.P.R. cymon*," and then says—

> "Habitat Imago m. Mai. f. ** Julio in cretaceis, rarissima fere omnium nostrorum cœruleorum; at nuper capta, et ad me missa, in comitatu Ebor, amicissimo meo P. W. Watson, et etiam in Norfolcia amicissimo meo J. Burrell."

Samouelle notes the species (*The Entom. Useful Compendium*, pp. 242, 381, 417), in 1819, as—

> *Lycaena cymon*. The Mazarine Blue. In Britain it is very local, but is found near Sherborne, in Dorset, in great abundance. Occurs in May, in chalky places; also in July.

In 1824, the same author repeats (*Entom. Companion*, pp. 242, 381, 417) (almost a reprint of the above work) the same facts, except that he gives "the middle of May" and "end of July," instead of "May" and "July." Stephens, in 1828, gave much fuller information concerning the species; he describes (*Illus. Haust.*, i., p. 86) it under the name *acis*, and notes it as—

> A scarce or rather a local species, found in chalky districts in Norfolk, Cambridge, Yorkshire, Dorsetshire, also near Brockenhurst and Amesbury,* Hants, and on Windlesham Heath, Surrey, towards the end of May and of July.

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* Amesbury is in Wiltshire. ** f = finis.

Of the appearance of this species in Britain, C. W. Dale gives following summary (*Hist. Brit. Butts.*, p. 58), from his father's "Entomological Journal," of the insect's appearance near Glanvilles Wootton, in Dorsetshire—"It was common in 1808; recorded once in 1811, once in 1812, common in 1813, 1814, 1815 (one being taken as late as August 1st), and 1816, scarce in 1817 and 1818, common in 1819, 1820, and 1821, scarce in 1822 and 1823, common in 1825 (20 captured June 13th), scarce in 1828, 1830, and 1831, common in 1834 and 1835, one only seen in 1836, a few in 1837, none in 1838, scarce in 1839 and 1840; in 1841, a pair on June 19th, the last seen in Dorsetshire." In 1833, a contributor to *Loudon's Magazine*, vi., p. 96, states that he captured in Monmouthshire, "a few examples that summer, in a single small field of not more than an acre in extent, sporting about the hay with *P. argus*, about the end of June and beginning of July." Bree notes (*op. cit.*, p. 190) that, in 1803, Haworth spoke of it as probably the rarest of our British "blues," and that he had received it from Yorkshire and Norfolk, but that, in the meantime, it had been recorded from Cambridgeshire, Dorsetshire, Hampshire, and Surrey, whilst Lewin had previously taken it near Bath. Bree says that he had since captured a ♀ in an open plantation near Coleshill Park, on June 28th, 1804, and another ♀, very worn, on July 15th, 1812, near Hinckley, Leicestershire; he possessed another example, captured in Warwickshire, probably near Birmingham, whilst a collector at Coventry had several specimens, taken near that town, which, at the time, he did not distinguish from "the common blue," whilst a ♂ was taken some 30 years before near Dudley; it appears, therefore, to be by no means common, but yet widely distributed, nor is it peculiar to chalk districts, but seems to delight in woody situations, abounding in grass. In 1837, Miss Jermyn (*Vade Mecum*, 2nd ed., pp. 74-5; pp. 148-9) amply describes the species, and adds—

> Chalk soils in Norfolk, Yorkshire, and Sherborne in Dorset. In May and July.

In 1839, Wood observed (*Ind. Ent.*, p. 8)—

> *Acis*. Chalk soils. Kent. May to July.

In 1841, Humphreys and Westwood (*Brit. Butts.*, p. 102) observe—

> *Polyommatus acis*. This rare species frequents chalky districts. The late Mr. Haworth gave Yorkshire and Norfolk as its localities, and Miss Jermyn, Sherborne, etc., Dorsetshire. Various parts of Cambridge, Hampshire, Windlesham Heath, Surrey, are mentioned by Mr. Stephens. There are also some notices of this insect in nos. 31 and 32 of *Loudon's Mag. of Nat. History*, by the Rev. W. T. Bree, who informs us that he took it in Coleshill Park, Warwickshire, also near Hinckley, Leicestershire; other specimens have also been taken in Worcestershire.

Stainton, in 1857 (*Manual*, i., pp. 58-9) describes it, and notes—

> Mr. Newman writes: "*P. acis* is common in Herefordshire. I used to take it in my father's fields in Leominster, 25 years ago. I have repeatedly seen it since, and suppose it to be as abundant as ever." The Rev. Jos. Greene took "two specimens (not good) of this rare species in a chalky field, near Lower Guiting, on the Cotswolds, the beginning of July, 1849*." Mr. Allis writes me: "I know of no captures within the last 7 years. The Birmingham collectors used to take it in plenty, but none have occurred recently that I know of."

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* These two "not good" examples have been the cause of some misunderstanding. As Greene provided Stainton with the Lower Guiting list for the *Manual*, one suspects the " " in the *Manual*, to represent a quotation from Greene's list of

A few notices of captures occurred between 1850 and 1862, chiefly in the *Ent. Weekly Intelligencer and Zoologist*, and these we have noted in our list of dates of captures and British localities. In 1862, Curtis noted (*Brit. Ent.*, 2nd ed., fo. 9):—

> *Polyommatus acis* . . . . occurs in chalky places from the end of May to the end of July, in Yorkshire, Leicestershire, Cambridgeshire, Norfolk, Coleshill in Warwick, Windlesham Heath in Surrey, Amesbury and Brockenhurst in Hants, Glanvilles Wootton in Dorset.

By this time the species had become practically extinct in England. With the exception of a few examples taken in South Wales in the "seventies," very few others have been recorded, and most of these must be accepted with caution. As giving some clue to the money value of the examples of supposed British origin at present in collections, we may note: (1) 4 examples in the "Naish coll.," sold at Stevens' salerooms, May, 1892, produced 18s. (*Ent. Rec.*, iii., p. 128); (2) 40 in the "Burney coll.," sold at Stevens', November, 1893, produced £17 10s. (*Ent. Rec.*, iv., p. 328); (3) 5 in the "Machin coll.," sold February, 1895, produced £2 6s. for 2, and £2 10s. for 3 (*Ent. Rec.*, vii., p. 135); (4) 4 in the "Tugwell coll.," sold December, 1895, produced £1 15s. and £1 10s. per pair (*Ent. Rec.*, vii., p. 189); (5) 8 in the "Fry coll.," sold March 9th, 1896, produced £1, £1, 18s., 14s., per pair (*Ent. Rec.*, vii., p. 313); (6) 18 in the "Sam Stevens' coll.," sold March, 1900, in sets of six, for £2 10s., £1 15s., and £1 15s. (*Ent. Rec.*, xii., p. 111); (7) 20 in the "Mason coll.," March, 1905, produced £2 5s., £3, and £3 10s., for 3 pairs, £2, £2 10s., £1 15s., for 3 lots of 3 ♂s each, £3 for 3♂s and 2♀s (*Ent. Rec.*, xxxviii., p. 113); (8) 7 in the "Barrett coll.," March, 1906, 3 for £3 15s., and 4 for £2 (*Ent. Rec.*, xviii., p. 110); (9) 2 in the "Greene coll.," May, 1906, £5 for the 2 examples (*Ent. Rec.*, xviii., p. 192). The variation in the price is considerable, partly, perhaps, due to want of information as to the origin of the specimens, more particularly, perhaps, in the case of specimens from standard collections of this description, due to difference in quality and condition. The following are the only exact dates of

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1857; but previously, in the *Zoologist*, x., p. 3494 (1852), Greene had written, in his "List of the Lepidoptera of the Cotswolds:" "*P. acis*, scarce, two, end of June," the two statements disagreeing somewhat. The statement from Stainton's *Manual* "two specimens at Lower Guiting, on the Cotswolds, the beginning of July, 1849," was copied into Newman's *Brit. Butts.*, p. 133, and was then copied by Dale (*Ent. Mo. Mag.*, xxxviii., p. 78), but with the wrong reference—*Zoologist*, x., p. 3494. At this time, after 45 years, Greene took objection to the statement (evidently his own as quoted by Stainton), and observed (*op. cit.*, p. 112) that "The *capture* is correct, but the *date* of the year, and the *month* of the capture are alike wrong . . . . Where Mr. Dale got his dates I know not, but it is sufficient evidence of their being wrong that I did not go to Guiting till October, 1849. The two *acis* were taken June, 1850. I was 'younger' then, and knew little or nothing about 'rarities,' but *now* I know that I was fortunate enough during the two summers of 1850-1, to capture 'eight' *acis* . . . . now in my comparatively small collection." He adds: "The reference to *Zoologist*, vol. x (published 1852, is to my 'List of the Lepidoptera on the Cotswolds, Glos,' written and sent to the editor in 1853, when I was at Halton, Bucks." This is very naïve, and one wonders how a list written in 1853 was published in 1852, and how the ignorant Greene, in 1853, distinguished two, and failed with six other, examples caught in 1850-1, and how Stainton quoted the dates Newman and Dale use, if Greene did not supply them. Considering how acute Greene was in pointing out the trippings of others, one wonders how he came to overlook both Stainton and Newman, whence Dale evidently got his dates. It is still more remarkable that at the sale of Greene's coll. (*Ent. Rec.*, xviii., p. 192), only 'two,' and not 'eight' examples were sold.

capture of this species that we can trace in our British literature: the last week in August, 1793, two or three specimens flying in a pasture field near Bath (Lewin); June 28th, 1804, one ♀ near Coleshill Park (Bree, *Loudon's Mag.*, vi., p. 190); June 22nd and July 2nd, 1808, at Glanvilles Wootton (J. C. Dale); July 24th, 1811, one only at Glanvilles Wootton (J. C. Dale) (Dale, *Ent. Mo. Mag.*, xxxviii., p. 78); July 15th, 1812, one ♀ near Hinckley (Bree, *Loudon's Mag.*, vi., p. 190); June 11th, 1813, common at Glanvilles Wootton (J. C. Dale); June 10th, 1815, common, one taken as late as August 1st, at Glanvilles Wootton (J. C. Dale); June 27th, 1816, at Powerstock (J. C. Dale) (Dale, *Ent. Mo. Mag.*, xxxviii., p. 78); July 16th, 1819, at Gamlingay (Dale, *Ent. Mo. Mag.*, xxxviii., p. 77); July 16th, 1818[†], at Windlesham Heath (Abbott); July 16th, 1819, common at Glanvilles Wootton (J. C. Dale); June 13th, 1825, twenty taken at Glanvilles Wootton (J. C. Dale) (Dale, *Ent. Mo. Mag.*, xxxviii., p. 78); June 20th, 1832, four ♀s and one ♂ in meadows near Leominster (Newman, *Brit. Butts.*, p. 133); May 28th, 1833, at Parley Copse (Vine *teste* Dale, *Ent. Mo. Mag.*, xxxviii., p. 78); about end of June, 1833, near Pontnewydd, in Monmouthshire (*Loudon's Mag.*, vi., p. 96); July 1st, 1833, at Madingley Wood (Stephens, *Ent. Mag.*, i., p. 528); August 5th, 1834, on Parley Heath, on the borders of Hants and Dorset, in plenty (J. C. Dale, *Loudon's Mag.*, vii., p. 499); 1835-7, in plenty in South Wales (near Merthyr) (Parry, *E.W.I.*, vi., p. 28); June 19th, 1841, at Glanvilles Wootton, one on a chalk-hill called Dungeon, the other in a field called Millett's Long Ground; these were the last specimens seen in Dorset (J. C. Dale) (Dale, *Ent. Mo. Mag.*, xxxviii., p. 78); June, 1842, ♀ at Stapleford, in a chalk-pit (Lee, *Zool.*, 1843, p. 257); end of June, 1850, two specimens at Lower Guiting (Greene, *Zool.*, x., p. 3494); May 2nd, 1854, at ? (Atkinson); one, early August, 1857, at Papworth Everard (Beadan, *E.W.I.*, iv., p. 141); one, June 20th[*], 1858, at Papworth Everard (Beadan, *E.W.I.*, iv., p. 141); July 10th, 1859, at Epworth, July 25th, 1860, a ♀ in a field where the one was taken in 1859, at Epworth (Hudson, *E.W.I.*, viii., p. 139; *Zool.*, xxii., p. 8985); June 24th, 1861, one specimen, Foxhall Heath (Garrett, *Bloomfield's Lep. Suffolk*, p. 7); a single specimen near Dursley, in June, 1865 (John, *Newman's Brit. Butts.*, p. 133); six specimens in mid-June, 1871, near Llantrissant, in South Wales (Hudd, *Ent. Mo. Mag.*, viii., p. 113); June 4th, 1875, a ♂ at Penarth, near Cardiff (the previous year eight ♂s and two ♀s taken in the same place) (Langley, *Entom.*, viii., p. 161); [August, 1880, at Croamhurst (Olliff, *Ent.*, xiii., p. 43); July, 1881 (not recorded till 1883), in the White Field, Abbott's Wood (Dynes, *Ent.*, xv., p. 135)].

Habits.—This species is most interesting in its habits, somewhat difficult to observe, however, because of its comparative shyness and its preference for wild, uncultivated land, although sometimes it may be found on the borders of cultivated land, or even on the outskirts of the fields themselves. It loves to stand with its wings drawn up, or only partially expanded, although, in the full sun, it often drops them completely. When walking it moves a leg on either side alternately, whilst the antennæ also wave up and down alternately; the wings are then usually held erect and nearly together, the forewings generally, at this time, being held well back so as partly to cover the hindwings. When disturbed, it brings its wings down very suddenly, and flies off with considerable speed. It is, like all its congeners, fond of flowers, and, on the hills near Grésy-sur-Aix, haunts the wild lucerne and sainfoin flowers, with *Everes argiades*, *Agriades coridon*, etc., and, on one occasion, we saw a ♂ busy at a flower of wild heartsease in the Dischmathal, whilst at Clelles it appeared to be most attracted by lavender and scabious; at Preda it was specially attracted to wild clover flowers, the ♂ s probably for nectar, the ♀ s for egglaying, but at Lavin the ♂ s frequented a labiate flower, that grows commonly on the slopes just above the village. At Gallipoli it was noted by Mathew as being especially fond of settling on flowers of wild thyme. Lambillion observes that, in Belgium, its flight is low, not very rapid, and it settles frequently on flowers. We observed, in a spot in the Göschenen-Thal, where this species was not uncommon, that, although the dark purple colour of the ♂ s of this species made them practically unmistakable on the wing; the black ♀ s were easily overlooked among the zigzagging *Aricia astrarche*, although the flight of the two species is considerably different. Hudd notes (*Ent. Mo. Mag.*, viii., p. 113) that he considers that the ♂ somewhat resembles the blue form of the ♀ *Polyommatus icarus* on the wing, although it is more richly coloured. Mathew considers that it is not such a quick flier as *Polyommatus icarus*, with which, near Gallipoli, it was generally in company, and it could always be distinguished from it on the wing by its mode of flight, as well as by its shade of colour. The dark purple of the ♂ s of this species, makes them rather easy to determine on the wing, but, as the species flies rapidly forward in somewhat extended curves, it is often difficult to follow, whilst its grey underside, brought into alternate view with the purplish upperside when flying, makes it almost impossible to see on a road, and one traces its course much more readily over herbage, than on a stony road, path, or bank. When settled in the sun, it opens its wings, the head usually downwards, and standing so that the sun's rays fall directly on the wings, shifting its position often, but not losing the effect of the sun's rays. At this time it often chooses leaves to rest on, but one ♂ was observed to be particularly fond of a flowerhead of clover, at Preda, on August 19th, 1907. We observed, at Airolo, during the first week of August, 1907, that, in cloudy weather, with occasional gleams of sunshine, *C. semiargus* can be disturbed rather readily, but flies actively in the sun. When at rest in dull weather, it sits with its wings over its back, its antennæ projecting in front, and quite motionless; as soon as the sun commences to shine again it lowers its wings gradually till they are well separated, but not very far, and then waves them gently, lowering them further and further, until at last they lie open fully exposed to the sun, and the insect is ready to fly. The black ♀ is very sensitive to the sun's rays, and appears to enjoy sitting with its wings partly open, so that the sun shines fully and directly on them. Towards the close of the afternoon of August 7th, 1907, at about 5 p.m., a cloudy and sultry spell ended in a threatened storm, and large rain-drops began to fall. At this time a ♀ *C. semiargus* got up from a clover-head in a field, and flew slowly some distance before settling again, although, on being boxed, it at once settled down to sleep. This species, when really at rest, stands with its forewings drawn well into the hindwings, as in *P. icarus*, the three upper spots of the submedian row on the underside of the forewings standing in continued series with the corresponding row of the hindwings, the discoidal spot of the forewing just showing above, and forming part of a second series, including the two spots towards the middle of the costa of the hindwing. The antennæ are thrown out well in front at the distance of fully a right angle from each other. When asleep, the forewings are much more withdrawn, and the extreme apical point alone is shown of the forewing. The ♂ is quite a regular visitor to the moist places by the roadsides in the Alps. We saw it frequently on a piece of waste ground between St. Michel-de-Maurienne and Valloire, through which the zigzags wind, drinking at the runlets that trickle here, there, and everywhere, where *Hirsutina damon* is in countless myriads, *Agriades coridon* and *Aricia astrarche* are nearly as common, whilst *Polyommatus icarus* (like *Cyaniris semiargus*) occurs freely without being abundant. At the runnels on the path near the Weissenstein Inn, in August, 1907, it occurred with numbers of *Agriades coridon*, *Plebeius argyrognomon*, *Polyommatus eros*, *P. icarus*, and *Latiorina orbitulus*. It also occurred at the running water by the roadsides, at Glaris and Spinabad, in the Landwasser Valley, as well as far up the Dischmathal, in the latter locality with *Vacciniina optilete*, *Albulina pheretes*, *Plebeius argyrognomon*, and *Polyommatus icarus*, and where these were almost the only species of blues. Moss observed it at puddles on the roads at Zermatt, in July, 1902, and Rowland-Brown notes it as abundant in June, 1899, near Digne, where the stream comes running down the historic little valley, above the Baths, into the Eaux-Chaudes, breaking the bed of the latter into little islands of rich black mud, with an abundance of ♂ *Polyommatus escheri*, and herds of *Polyommatus icarus*, *Agriades bellargus*, *Cupido sebrus*, and *C. minima*. Lowe notes the same habit, the species gathering at the patches of moisture in the Val Anzasca, with other species of blues. The habit is evidently general, for the species is reported as occurring in numbers at moist places in the roads at Salzburg (Richter), in Carinthia (Höfner), and in Moravia (Schneider), whilst Holtz saw it near Gözna, at 1000m. elevation, sitting commonly with other Lycænids at puddles in the road. Dadd records both sexes (the ♂ s worn, the ♀ s fresh) at patches of damp earth in the Oythal, in June, 1905, accompanied by *Cupido minimus* which was in boundless profusion; we can confirm this record, for we noted a ♀ drinking greedily at a puddle, near Lavin, in the Lower Engadine, August 9th, 1908, as well as many ♂ s at a spring just above Lavin, the same day.

[†] This is written July 16th, 1878, in *Ent. Mo. Mag.*, xxxviii., p. 78.

[*] This is made July 20th, in Newman's *Brit. Butts.*, p. 133.

Habitats.—Distributed, as this species is, from the hot plateaux of Spain and Asia Minor, and the mountain slopes of Sicily, Greece, and Syria, to well inside the Arctic Circle, or even the shores of the Polar Sea, and from the extreme western shores of France and Portugal, to the shores of the Pacific Ocean, its habitats are sure to be varied and extreme. That it can brave the greatest winter cold is certain, for it lives under evidently sedentary conditions, in the high Alps of central Europe up to 7000ft. or 8000ft. elevation. We have taken it on the Airolo side of the St. Gothard Pass, between the pinewoods and the summit, the species occurring quite naturally, and not at all uncommonly on the exposed slopes, where the vegetation is distinctly subalpine, and the elevation well above 6000ft., and where its only immediate neighbours appeared to be *Chrysophanus hippothoë*, *Brenthis pales*, *Erebia tyndarus*, *E. euryale*, *E. mnestra*, *Anthrocera exulans*, and other species that love the higher habitable altitudes of the Alps; we found it again on the flowery slopes around the Lac d'Allos, in the Basses-Alpes, at a height of quite 7400ft., where *Erebia glacialis*, *E. gorge*, *Colias phicomone*, and other sedentary alpine species were to be found, mixed, however, with such occasional visitors as *Colias edusa*, and *Gonepteryx rhamni*, which were observed as stragglers at this unusual elevation, but *C. semiargus* evidently here also belonged to the native fauna, and was quite at home. It occurred, too, on the flowery pasture slopes at the back of the hospice at Le Lautaret, from 7200ft. to 8000ft., haunting the flowers with *Cupido minimus*, *Polyommatus eros*, *P. icarus*, *Hirsutina damon*, *Plebeius argyrognomon*, etc., which all reached this unusual elevation; but Le Lautaret is the most delightful alpine wild flower garden. In its more lowland haunts, however, it loves the outskirts of woods, openings of forests, wood-clearings, wooded hills, wild meadows, exposed flowery slopes, etc., haunting almost always the wildest spots, although occasionally to be found on the outskirts of cultivated land, rarely choosing, however, the cultivated fields themselves. We have found the species flying commonly (in its second brood) in the sheltered openings of the woods that clothe the Grésy hills, sharing the wild sainfoin and lucerne flowers, with *Everes argiades*, *Agriades coridon*, *A. bellargus*, *Polyommatus icarus*, and the whole army of lovely insects that abound on these slopes; in the Rhone valley, it occurs between Roche and Yvorne, on the rough, steep, flower-covered, broken, rocky slopes, that reach to the roadside, flying with an abundance of *Agriades coridon*, *Polyommatus icarus*, *Melanargia galathea*, *Melitaea didyma*, *Hipparchia alcyone*, and many other interesting species. We have found it on the waste ground, through which the zigzags rise between St. Michel-de-Maurienne and Valloire, by the grassy roadside banks of the Dischma-Thal, in the flowery hollows, divided by rough rocks and bushes that run up from the banks of the Arve to the village of Lavancher, in the flowery meadows high up above Megève, towards Mont Joly, on the waste slopes by the roadside at Abriès, in the large openings by the larch forest, on the way up to the Col de la Lauze, as well as in the similar openings in the forests on the way to the Crête de Reychasse; above Preda it occurs all the way up to the Weissenstein, by the roadside, apparently affecting *Anthyllis* with *Cupido minimus*, whilst we found it also high up at Arolla, where it occurs on the borders of the wood between the Hotel Collon and the Kurhaus. It was seen flying freely on the steep grassy lower slopes of the Wormser Joch, well above Santa Maria; it also occurs on the waste ground between Santa Maria and Münster, with *Agriades coridon*, *Aricia astrarche*, *Polyommatus icarus*, and swarms of *Erebia aethiops*, etc.. just below the hospice on the Fluela Pass, and on the slopes between Lavin and Guarda. The liking of this species for marshy meadows has been repeatedly noted. Brabant, to whom we are so greatly indebted for a first knowledge of the life-history of this species, notes it as loving marshy meadows where *Trifolium pratensis* grows wild in the Cambrai district where he has studied it. We have ourselves seen it in similar spots, often high on the mountains, and it was, therefore, only to be expected that the great stretches of natural bog-land on the hills above the Lake of Zürich, should be one of its chosen haunts;

among these hills, numberless fresh-water springs rise on the hillsides, or in the hollows between the hills, collecting in the hollows as large pools, in which, in the course of ages, vast deposits of peat have been formed, choking the pools, and forming wide stretches of quaggy bog covered with cotton-grass, rushes, reeds, sedges, and coarse grass, with a large quantity of aquatic plants, with here and there higher-lying ridges covered with a great wealth of sweet-smelling orchids, lythrum, vicias, large-flowered centaureas, *Anthyllis*, etc. The outskirts of these stretches of bog, carry a grand butterfly fauna, and here *Cyaniris semiargus* sports with *Lycaena alcon*, *L. arcas*, *Polyommatus icarus*, *Loweia dorilis*, and a host of other interesting species, whilst the lower part of the bog is the chosen home of *Coenonympha tiphon*. In Scandinavia it is reported from the railway banks between Disenaen and Saeterstoen, but also at Bolkesjo, about 1700ft. above sea-level (Standen). It is said to occur in meadows in the Baltic Provinces, in the Riga district (Teich), but in bushy places on the banks of streams, and in openings in woods in the Government of Moscow (Assmuss), whilst it is reported as being everywhere common in fields and grassy places, in the provinces of Casan and Orenburg, indeed, the most common of all the Lycænids in this district (Eversmann). In Belgium, it occurs in natural meadows, on high grassy plateaux, etc. (Lambillion). In France, it is widely and generally distributed from the sea-level to the alpine region of the highest mountains. In the Dept. Nord, it is reported, as we have already noted, as being common in marshy meadows, in the neighbourhood of Cambrai, where tufts of *Trifolium pratensis* grow freely (Brabant). In the lowlands of Haute-Savoie it occurs at the foot of the Grand Salève, on rough, wild slopes, on the outside of the wood, covered with flowers, a most delightful butterfly corner, already described in these volumes. Its haunts in the mountain districts near Chamonix, on the Brévent, near Lavancher, etc., are chiefly on wild flower-covered slopes on the outskirts of the larch woods, very similar, indeed, to its Swiss habitats in similar localities. We found it at the end of July, 1906, on the dry flowery slopes at Clelles, at scabious and lavender flowers, with *Polyommatus meleager*, *P. hylas*, *P. icarus*, *Aricia astrarche*; a few days later we observed it in the little valley that opens into the Eaux-Chaudes stream near Digne, with *Agriades coridon*, *Plebeius argyrognomon*, *Polyommatus hylas*, *P. icarus*, etc.; then again on the steep slopes between Allos and Colmars, with an abundance of *Erebia neoridas*, *Anthrocera fausta*, *A. carniolica*, *Loweia gordius*, etc.; yet again it occurred high up the Val d'Allos, on a stretch of ground somewhat heath-like and moorland in character, where it lived with *Polyommatus eros*, *Hirsutina damon*, *Agriades coridon*, *Plebeius argyrognomon*, *Aricia astrarche*, *Cupido sebrus*, etc., and then on the mountain pastures above the Lac d'Allos itself. In the Juras, Gibbs found it in an old grass-grown pit outside the forest of Charmes, with *Everes argiades*, as well as in the meadows behind the town. In Italy it is recorded from the hills near Brianza, and the woods near Alzate in Lombardy (Turati); almost everywhere in meadows, fields, moist open places in woods, as well as in the plains as in the hills and mountains (Stefanelli); in the mountains of Piedmont the localities are much the same as in those of Switzerland, *e.g.*, in the Val Véni, at the foot of the imposing Aiguille Noire de Pétéret, where the Allée Blanche opens out to the foot of the moraine of the Glacier de Miage, the lovely Dora, has laid out a level flat of loess, extending for many acres, formerly no doubt a lake, and now sparingly covered with larches and wild flowers; this is an excellent locality for *C. semiargus*, as well as for *Hirsutina damon*, *Agriades coridon*, *Aricia donzelii*, and swarms of *Plebeius argyrognomon*. The wind-swept slopes of the Mont de la Saxe, the pastures of the Val Ferrex, and the upland pastures of Chavanis, far above Cogne, present a marked contrast with the lovely wooded slopes of the Val Anzasca, where the species also occurs in abundance; indeed, this beautiful valley reminds one rather of the conditions occurring around Locarno, and in the Valle Leventina in Ticino, where this species also is found commonly. In Germany it is reported to occur in Mecklenburg, in marshy meadows, moist open fields, on the edges of forest and marsh lands (Schmidt), and to be not rare in all the woods and meadows near Friedland (Stange); in meadows, by roadsides, and in forests at Lübeck, but rarer than *Polyommatus icarus* (Tessmann); loves dry and moist localities, *e.g.*, meadows, outskirts of woods, woodland glades, roadsides, fields and slopes, at Parchim, etc. (Gillmer); and occurs in moist meadows at Pennin in Pomerania (Spormann); it also occurs in the North Sea Islands, *e.g.*, in the Sylt Islands with *Polyommatus icarus* (Werneburg); it is noted as common in meadows at Lüneburg (Machleidt and Steinvorth); on dry lawns at Hanover (Peets); sometimes abundant in the Rhine meadows near Uerdingen, Friemersheim, etc. (Stollwerck), also in grassy places and in meadows near the Rhine (Rothke); in meadows, forests, and forest glades in Hesse (Koch); whilst it is very common in early summer in forest openings in the mountainous localities, especially in the Hinterland, Winterstein, etc., although it is quite rare in the lower regions (Glaser); it occurs in a sloping dry meadow on the outskirts of a wood at Wiesbaden (Prideaux), but it is rather rare in the forest glades of the Taunus (Rössler), and near Oberursel (Fuchs), whilst, at Braunfels, in the Taunus, in mid-August, 1900, it occurs chiefly in damp meadows which happen also to be the best Lycænid ground in the neighbourhood, *Lycaena euphemus*, *L. arcas*, and more sparingly *L. arion*, occurring in the same place; a wide stream runs through the meadows, and the flowers apparently last here longer than on the higher ground, and attract the butterflies (Sich); it occurs throughout Waldeck in somewhat moist meadows (Speyer), and prefers flowery slopes at Zeitz-on-Elster (Wilde); in Anhalt, it occurs sparingly on heaths, by the edges of forests, and in dry meadows and grassy pastures (Gillmer), and at Wernigerode in forest-glades (Fischer), it inhabits the meadows, woods, and fields throughout Posen (Schultz), is found in Silesia, in forest-glades, on the outskirts of woods throughout Upper Lusatia (Möschler), and on the lowlying heaths at Siegersdorf (Sommer), whilst in meadows on the foothills of the Silesian mountains it is common, but rarer in the plains (Wocke); it is one of the most abundant "blues" in the Sprottau district, occurring in meadows, by the sides of roads, etc., in two broods (Pfitzner); it is chiefly found in forest-glades at Dresden and in the mountainous parts of Saxon Upper Lusatia, being strangely reported as most abundant in cabbage-fields near Reudnitz (*Ent. Ver. Fauna*), and is said to prefer roads and clearings in forests in Württemburg (Löffler), whilst, in Baden, it occurs in the mountains and foothills up to 3600ft., and is specially noted as occurring around the sources of the Danube (Reutti); it was locally abundant at the end of May, 1906, near Lahr, on small limestone hills at the edge of the plain, although it also occurred occasionally elsewhere (Keynes). In Bavaria it is found in the forest-glades of the lowlands (Schmidt), is particularly common around Munich (Kranz), and in meadows at Kempten (v. Kolb); in the mountains, it occurred on an extensive sandbank laid down by the river near Oberstdorf, and overgrown with willow and other bushes, with *Lycaena arion*, *Agriades bellargus*, *Polyommatus icarus*, *Cupido minimus*, *Plebeius argus* (*aegon*), *P. argyrognomon*, etc.; it also occurred in the Oythal with *Cupido minimus*, the latter in profusion (Dadd). In Switzerland we have already noted many of its characteristic habitats, but, around Geneva, it is common in wood-clearings, where it flies with *Glaucopsyche cyllarus* and *Cupido sebrus* (Blachier); whilst it is distributed almost everywhere by the roadsides and footpaths of the mountains up to 2300m., right into the alpine region (Favre); it occurred in May, 1907, in the Lavey Woods, amidst a profusion of flowers and some interesting insects—*Glaucopysche cyllarus*, *Celastrina argiolus*, *Brenthis euphrosyne*, *Leptidia sinapis*, etc.; it was common also on the banks of a little stream between St. Triphon and Bex, where *Cupido sebrus*, *C. minimus*, and *Polyommatus icarus* were common, *Plebeius argyrognomon* being more sparingly represented, and *Glaucopsyche cyllarus* going over; it was found also near Sion, where the meadows were a glorious sight, although the railway banks were the most prolific hunting-ground, and where "blues" of various kinds, including *C. semiargus*, were most abundant; in another butterfly corner, near Sonciez, also "blues" were swarming—*Agriades bellargus*, *Polyommatus hylas*, *P. icarus*, etc., occurring with *C. semiargus* (Tetley); midway between Vissoye and Zinal, near the chapel of St. Laurent, it was seen in swarms in August, 1898, with *Plebeius argus* (*aegon*), *Polyommatus eros*, *P. hylas*, *Aricia eumedon*, etc. (Rowland-Brown); whilst, on the southern side of the Alps, it haunted the roadsides at Orta, and was found in the Val Anzasca, with other species of blues. In the north of Switzerland, it appears to be widely distributed as a constant inhabitant of the bogs above the Lake of Zürich; at the end of July, 1908, it occurred freely, though worn, as we have already noted, in the bogs above Staefa, and near Einsiedeln, when we were hunting *Coenonympha tiphon*, in its chosen haunts in this neighbourhood. The species also occurred at the end of July, 1906, on the slopes above Göschenen, where a little stream, trickling down the mountain-side, made here and there a flat marshy spot, that this species shared with *Coenonympha darwiniana* and *Brenthis pales*; also on a low swampy piece of ground covered with flowers, and swarming with butterflies, *C. semiargus* was quite abundant, with numbers of *Brenthis amathusia*, *Heodes virgaureae*, *Chrysophanus hippothoe*, *Lycaena arion*, etc., in the Göschenen-Thal. It also occurred on the slopes at the entrance to the Val Tremola, high above the pine forests of Airolo, on the way up the St. Gothard Pass, on the exposed slopes where the only "blue" besides *C. semiargus* was *Aricia astrarche*, but where plenty of *Argynnis aglaia* dashed up and down the slopes, and *Erebia tyndarus* and *E. euryale* were abundant, as well as on a small marshy spot still higher up the Pass, where *Brenthis pales*, *Chrysophanus hippothoë*, *Hesperia alveus*, and *Polyommatus hylas* alone kept *C. semiargus* company; on the flowery slopes leading down to the alder carr, near the bridge between Airolo and Piotta, it flew with *Lycaena arion*, and swarms of *Agriades coridon*, *Aricia astrarche*, *Plebeius argus* (*aegon*), *Polyommatus hylas*, *P.*

icarus, and a host of larger species; also on the flat beyond, where it haunted the thyme with *Loweia gordius*, *Plebeius argyrognomon*, *Aricia eumedon*, etc. It was observed in the marshy hollow at the entrance to the Val Roseg, with *Polyommatus eros*, *Aricia donzelii*, *Cupido minimus*, *Agriades coridon*, *Plebeius argyrognomon*, *Aricia astrarche*, etc., and yet again on the Albula flower slopes just above Lake Palpuogna, and again on those directly outside the Via Mala (Tutt). Keynes also records it as occurring on the slopes running down to the stream, in the Suvretta-Thal, quite near Campfer. In Austria it is recorded as occurring in the forests and meadows of Bohemia (Nickerl), in June, 1883, it was very common among long grass at the upper part of the valley near Carlsbad (Becher); it is found in meadows and by roadsides, particularly choosing moist situations in Moravia (Schneider); flies in forest-glades in Upper Austria (Brittinger); in dry meadows throughout Lower Austria (Rossi); and is common in the plains in Salzburg, but extends up to the Alps (Richter); it particularly loves moist pasture lands, but is also one of the most widely-distributed "blues" in Carinthia, extending up to the higher alpine region (Höfner); in the Tyrol, it reaches from the lower alpine region, to almost 8000ft., occurring all over the Dolomites in the high mountain meadows, haunting the "serpents" of the Mendelstrasse, and the topmost pastures of the Penegal (Tutt); at Brenner the commonest blue, occurring on the Postealp, an isolated grassy promontory between higher ranges, approached through firwoods, their slopes at first gay with the alpine-rose, and then followed by mountain moor, morass, and loose stones (Rowland-Brown); whilst above Cortina it was very abundant, flying in company with *Albulina pheretes* (A. H. Jones). In the Bucovina it occurs in the rich meadows on both sides of the road, leading through a deciduous wood on the north slope of the Cecina Mount near Czernowitz, at an altitude of about 400 mètres, the species not being often met with elsewhere in the district (Hormuzaki). In Spain it is reported as occurring in the hollows of the hills near Albarracin (Zapater), whilst by the side of a brook to the east of La Granja, where the stream runs through a well-wooded dell, from the pastures above, *C. semiargus* occurs with a host of other species, particularly above the wooded district (Sheldon), as well as in the dried torrent beds near Alfakar, at the foot of the north side of the wooded hills (Rambur). In south-eastern Europe, in Bulgaria, it occurred in the Rilska valley, on some broken ground, where granite blocks had rolled down from the precipices on a sheltered meadow at the foot of the wood, the rocks overgrown with all kinds of flowering weeds, and intersected by a tiny stream forming a sort of natural rock-work, with *Scolitantides orion*, *Aricia eumedon*, *Agriades bellargus*, *Polyommatus hylas*, *P. icarus*, etc.; it was seen also in some wet fields on the slopes of the Vitoch near Sofia, with *Aricia astrarche*, *Plebeius argus* (*aegon*), *Agriades bellargus*, *Polyommatus icarus*, etc.; it was found also on the sandstone hills to the west of Slivno, as well as about halfway up the Drinaça (6650ft.), in a steep meadow with *Melitaea aurinia*, *Cupido minimus*, *Hesperia alveus*, etc., whilst it appeared to be the only blue on the high slopes of the Rhodope, around Samakov, at the end of June, a locality with a remarkable growth of ferns and mosses, but with few Rhopalocera. It was found in Bosnia, on a plateau on the limestone mountain, Vlasic Planina, near Travnik, at 4500ft.

elevation, in mountain-meadows, with much brushwood, where also *Lycaena arion*, *Aricia eumedon*, *Nomiades iolas*, *Polyommatus amandus*, *Brenthis hecate*, and many other species occurred (Nicholl). In Turkey several ♀ s were observed at Port Baklar, about 12 miles from Gallipoli; the species was also very common on grassy slopes in the neighbourhood of Gallipoli; it was, indeed, the most abundant of the blues on the shores of the Dardanelles in 1878-9, and was particularly common in the neighbourhood of Gallipoli and the Bulair Lines; it frequented banks and slopes and the roadsides where the herbage was not very luxuriant (Mathew). In Asia Minor, Miss Fountaine records (*Ent.*, xxxvii., p. 79) it from Tchekirghé, near Broussa, a beautifully situated village at the foot of Mount Olympus, in a well-watered country, where it occurred with *Polyommatus anteros*, *Melitaea arduinna*, etc. She also took it later in June, at Amasia, whilst the species (second brood) was again captured in the pine forest on the old Silva Road, near Tokat, in July, but Holtz notes its love for the mountains in Cilicia, stating that he took it in May, in the Taurus, on the Tafelbergen, and later in June, near Gözna, at an elevation of 1000m. Mrs. Nicholl says (*Ent. Rec.*, xiii., pp. 171-2) that she captured it on May 14th, 1900, at Beit Chabab, a flourishing village in the Lebanon, about 3000ft. altitude, completely embosomed in mulberry trees; also three days later on the lower slopes of Djebel Sunnin, near Zaleh, at about 5000ft. above the sea, in a beautiful spot on red sandstone formation, where grass and water were abundant, and rhododendrons and *Osmunda regalis* grew in the watercourses, whilst two days later it occurred on the eastern side of the ridge, where Mrs. Nicholl had gone to climb the limestone mountain Djebel Kineyseh; one wonders whether there is any connection between the extreme coloured var. *antiochena* and the red sandstone formation. The species, indeed, in this beautiful eastern form, appears to be spread over the Lebanon from 2000ft. to 5000ft. Graves notes (*Ent. Rec.*, xix., p. 68) that it occurred near the summit of the Djebel Barouk, above Ain Zahalta, at a height of about 6500ft.; one worn ♂ was taken, in company with *Polyommatus amandus* and *Glaucopsyche cyllarus*, in a mountain-meadow some 1500ft. lower; it did not occur abundantly on the mountain, flying, for a "blue," rather slowly, over patches of grass and flowers in an open and stony cedar-wood. Of its habitats in Central Asia, we know very little. Grum-Grshimailo states (*Rom. Mém.*, iv., p. 116) that, in the Pamir, it is an inhabitant of the lower meadows of the alpine zone, clearings, marshes, and land generally covered with a rich meadow vegetation. Alphéraky records it as occurring in the Kounguesse-Thal, up to an altitude of 7000ft., whilst in the Sarafshan Valley in Turkestan, Funke captured it up to a height of 9000ft.

British localities.—This species appears now to be extinct in this country,[*] although at one time it was widely distributed and not uncommon.—Cambridge: chalky districts—Madingley Wood, not common (Stephens, *Ent. Mag.*, i., p. 528), Gogmagog Hills (Denny, *Ent. Mo. Mag.*, xxxviii., p. 77), at Papworth Everard (Beadan, *E.W.I.*, iv., p. 141), Cherry Hinton, near Cambridge, Lawston, many years ago (Bond, *Newman's Brit. Butts.*, p. 133), Gamlingay (Dale, *Ent. Mo. Mag.*, xxxviii., p. 77). Dorset: Sherborne, very local but abundant (Samouelle), Hazlebury, Powerstock, Parley Copse [last taken in 1841] (Dale, *Ent. Mo. Mag.*, xxxviii., p. 78). [Essex: Epping Forest, one (*Young England*, 1860) (most probably an error *see* Huckett, *Zool.*, xxi., 8605); Saffron Walden, formerly (*teste* Joseph Clark, V.C.H.).] Glamorgan: Merthyr (Parry, *E.W.I.*, vi., p. 28), Penarth near Cardiff (Langley, *Ent.*, viii., p. 161; Williams, *op. cit.*, p. 271: Heath, *Ent.*, x., p. 19), Croesgid, near Llantrissant, rare (Evan John, *Newman's Brit. Butts.*, p. 133) (see also Hudd, *Ent. Mo. Mag.*, viii., 113, and Prest, *Ent.*, xi., p. 104. Gloucester: two, Lower Guiting (Greene, *Zool.*, x., 3494; *Sta. Man.*, i., p. 59; *Newman's Brit. Butts.*, p. 133), Stapleford (Lee, *Zool.*, 1843, p. 257), Stinchcombe and Break Heart Hill, near Wootton-under-Edge (Perkins, *Newman's Brit. Butts.*, p. 133), near Dursley (John, *Newman's Brit. Butts.*, p. 133) see also Hudd's *List of Lepidoptera Bristol District*, p. 161). Hants: Brockenhurst (Stephens, *Illus.*, i., p. 86), near Ringwood (Vine *teste* Dale, *Ent. Mo. Mag.*, xxxviii., p. 78). Hereford: Olden Barn, 4 miles from Leominster (Newman, *Zool.*, 1862, preface; *Brit. Butts.*, p. 133). Kent: chalky soils (Stephens) [Cuxton district, ? 1873 (Farrow *teste* Tutt, *Brit. Butts.*, p. 166)]. Leicester: Hinckley (Bree, *Loudon's Mag.*, vi., p. 96). Lincoln: Epworth, near Bawtry (Hudson, *E.W.I.*, viii., 139; *Zool.*, xxii., p. 8985), Isle of Axholm, once (Allis, *Newman's Brit. Butts.*, p. 133). Monmouth: St. Julian's, one (Lock, *Newman's Brit. Butts.*, p. 133), Pontnewydd (Conway, *Loudon's Mag.*, vi., p. 96). Norfolk (Burrell *teste* Haworth): chalky districts (Stephens). Northampton: formerly—Sywell Wood (Hull and Tomalin *teste* Goss, *Ent. Mo. Mag.*, xxxvii., p. 61). Pembroke: Tenby (Edwards, *Ent.*, xvi., p. 210). Somerset: formerly near Bath (Lewin), one on Leigh Down, near Bristol, 1867, in the Grigg coll. (Hudd's *List of Lepidoptera of Bristol district*, p. 162), Frome, Norton St. Philip, near Buckland Dinham* (Parsons *teste* Mathew, *in litt.*). Suffolk: Foxhall Heath, one (Garrett *teste* Bloomfield, *Lep. Suffolk*, p. 7); Woodbridge district¶ (Rowland-Brown, *Ent. Rec.*, xi., p. 278). Surrey: Windlesham Heath† (Stephens), [near Mickleham (Beattie) (no doubt an error)‡,] reported by Brewer as being taken many years ago on Reigate Hill and near Headley (V.C.H.). Sussex: Lewes district (Stainton, *Trans. Ent. Soc. Lond.*, v., p. 234); Croamhurst (Olliff, *Ent.*, xiii., p. 43), formerly two taken near Chailey in the collection of the late Mr. Unwin, of Lewes (Jenner, *Proc. Eastb. Nat. Hist. Soc.*, 1885-6), [another reported as captured in July, 1881, in the White Field, Abbott's Wood (Dynes, *Ent.*, xv., p. 135)]. Warwick: Coleshill Park, Coventry, probably near Birmingham (Bree, *Loudon's Mag.*, vi., p. 96); [Wolvey** (*teste* Flint, *Ent.*, xxxv., 239, captured 1896, not recognised till 1902—possibly an error;] formerly in plenty near Shirley (Enock, *Newman's Brit. Butts.*, p. 133). Wiltshire: Amesbury† (Stephens, *Illus.*, i., p. 86). Worcester: one taken about 1801, near Dudley (see *Loudon's Mag.*, vi., p. 96); formerly near Croft Farm, *seen* July, 1855; Hawford, near Worcester, Trench Woods, Hilly Fields (V.C.H.). Yorks: chalky districts (Stephens); York district (Watson *teste* Haworth).

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[*] See Chapman on "Why is *Cyaniris semiargus* now not a British insect?" (*Ent. Rec.*, xxi., pp. 132-133).

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* In a letter from my brother, the Rev. Murray A. Mathew, Vicar of Buckland Dinham, near Frome, dated September 14th, 1895, he informed me that he had just seen three examples of *Lycaena acis* that had been taken some years ago near Frome, by a Dr. Parsons, and were then in the possession of Dr. Frederick Parsons, his son. Dr. F. Parsons also told my brother that he found *L. acis* common a few years ago in a field at Norton St. Philip, a village about 5 miles from Buckland Dinham, in the direction of Bath. In order to make sure that there was no mistake in the identification of the species, I wrote to my brother to ask if Dr. F. Parsons would kindly send the butterflies to me for my inspection, and in the course of a few days I received them—three undoubted *L. acis*, two males and one female, in wretched condition, and badly set on large common white pins (G. F. Mathew, *in litt.*).

¶ This butterfly must have been fairly common in Suffolk in the first half of the nineteenth century. In an old collection made in the "thirties" or "forties" by Dr. Jones, of Woodbridge, I found a number of *C. semiargus* taken in the county, and probably at this locality. They were all much faded, having been kept in an open case, but there can be no doubt as to their being genuine Suffolk examples (Rowland-Brown, *in litt.*).

† Dale notes (*Ent. Mo. Mag.*, xxxviii., p. 78) the example here recorded, as "captured July 16th, 1878, by Dr. Abbott." It should no doubt be "July 16th, 1818."

‡ A ♂ and a ♀ *Lycaena acis*, exhibited at the meeting of the City of Lond. Ent. Soc., November 7th, 1908, were stated by Mr. Beattie to have been captured either by himself or his daughter in the neighbourhood of Mickleham, Surrey, during 1904 or 1905 (*Ent.*, xxxix., p. 24). No doubt, among so much uncertainty as to the captor and the year of capture, some error had arisen as to the origin of these examples.

** A fine specimen exhibited by Mr. Flint at the *Birmingham Ent. Soc.*, September 15th, 1902, and stated to have been taken in 1896 at Wolvey, and not at first recognised (*Ent.*, xxxv., p. 329).

Distribution.—The species extends from about 66°N. lat. (Swedish Lapland) in the north, to 33°N. lat. (Syria, Persia) in the south, and from 8°W. long. (Portugal) in the west, to 132½°E. long. (Askold) in the East. The following are the detailed records:—Asia: Asia Minor—Taurus Mountains (Lederer), Tchekirghé near Broussa, Amasia, Tokat Alps (Staudinger), Sivas, near Tokat (Fountaine), Pontus (Staudinger); Cilicia—Tschekor Köslü on the Tafelbergen, near Gözna (Holtz); Syria—the Lebanon, from 2000ft.-5000ft., Baalbek, Djebel Kineyseh, Djebel Sunnin, Beit Chabab (Nicholl), Ain Zahalta district, near Maharain (Fountaine), the Ain Zahalta Cedars, at Djebel Barouk (Graves); North Syria—Shar Derésy (Brit. Mus. coll.); Mesopotamia—Malatia (Brit. Mus. coll.); Hyrcania (Lederer), Armenia, North Persia (Elwes); Persia—Astrabad (Lederer), Tash, Shahkuh, Hadscyabad (Christoph), Iran (Grum-Grshimailo); West Siberia—Kirghiz Steppes (Grum-Grshimailo); Bokhara—Derbent (Brit. Mus. coll.); Turkestan—Sary Ob, Sarafshan, 7000ft.-9000ft. (Funke, Brit. Mus. coll.); Sarafshan Valley—Margusur-Kul, Artutsch, Iskander-Kul (Grum-Grshimailo), Altai mountains (Elwes), Ongodai (Jacobson), Bashkaus and Bija Valleys (Elwes), Arasai (Leder), south-western Altai (Kindermann and Ruckbeil), the upper Irtish Valley, between Ustkamenogorsk and Ustbuchtarminsk (Lederer); Fergana—Namangan (Brit. Mus. coll.); Thian-Shan—Yir-Madaus (Grum-Grshimailo); Thian-Shan and Kuldja—Kounguesse-Thal to 7000ft. (Alphéraky); Ala Tau—near Lepsa (Haberhauer); the Pamir—Chakhimardan, the valley of Khingoob (Grum-Grshimailo); East Siberia—Winterberge (Middendorf); the Kentei mountains (Staudinger); Amurland—Raddefka (Christoph), Chabarofka, Pokrofka (Graeser *teste* Staudinger), near Borbi (Schrenck), Sutschan (Dörries, Brit. Mus. coll.), Isle of Askold (Dorries), Blagovestchensk (Brit. Mus. coll.); the Lena district—Witim and Wilui (Herz), Kokonor (Grum-Grshimailo); the Bureja mountains—north side of Lake Baikal, Lower Ussuri (Bremer); Mongolia—Changai mountains (Leder). Europe.—Austria-Hungary: nowhere rare (Höfner); Bohemia—Prague, Krc (Nickerl), Carlsbad, common (Hüttner); Moravia—Brünn (Schneider), between Mährisch-Trübau and Undangs (*Ent. Zeits. Gub.*, viii., 3), Neutitschein, Rattalowitz (Fritsch); Upper Austria—Inn district, not rare, Pöstlingberg, Buchenau, Weyer (Himsl), Linz (Fritsch), Ischl, etc. (Hormuzaki); Lower Austria—Gresten (Schleicher), Hernstein district (Rogenhofer); Salzburg—near Salzburg, not rare (Nickerl), the Gaisberg (Bentall), Gastein (Rühl); Tyrol—the Stelvio to 7000ft. (Speyer), up to 6000ft., not rare (Hinterwaldner), Trafoi (Rowland-Brown), the Glockner district, Bozen, Trient (Mann), Brenner (Rowland-Brown), Mendel Pass (Tutt), Campiglio (Lemann), the Dolomites, the Misurina Lake, Cortina (Mann and Rogenhofer), Innsbruck, frequent, the Taufers Valley, common (Weiler), the Brenner district Navis, between Matrei and Steinach, etc. (Galvagni), Schlucken Alp, Höttinger Alp, Kaisergebirge, Patscherkofel, Riesenferner group, Schlern, M. Baldo, Nardis, Brenta, Franzenshöhe, Sulden (Heller), Bregenz (Fritsch); Hungary, throughout—Budapest (Lemann), Eger, Parád, Pécs, Sopron, Pozsony, Tavarnok, Gács, Rózsahegy, Rozsnyó, St. András, Kocsócz, Gölniczbánya, Eperies, St. Gothárd, Gyake, Nagyszeben, Nagyág, Mehádia, Orsova, Vinkovcze, Lipik, Nagy-Lévárd, Beszterczebánya, Kir Tapolesany, Koritnicza, Zolyom-Lipcse, Nagy-Bocsko, Bustyahaza, Tichueza, Elöpatak, Ferenczfalva, Plitvica, Josipdol, Raduc, Fiume (Aigner-Abafi); Carinthia—one of the most widely distributed species up to the alpine region—Raibl Valley (Mann), near Paludnig, on the Vorderberg Moss, Sau Alpe (Höfner), Friesach (Rühl), Portschach (Wagner), Wolfsberg, Villach (Lemann), Mödling (Lang); Carniola—Oberfeld (Mann); Dalmatia (Mann); Croatia—Josefsthal (Mann), Agram district, common, especially in the Jelenovac Valley and near Podsused (Grund); Styria—Admont (Blachier); Galicia—Cracow district, Czatkowice (Zebrawski); Bukovina—the Cecina mts., near Czernowitz (Hormuzaki). Belgium: very local without being rare—Mt. St. Pierre, Liège, Hertogenwald (Donckier), Tête du Pré, Mozet, Fond d'Arquet,

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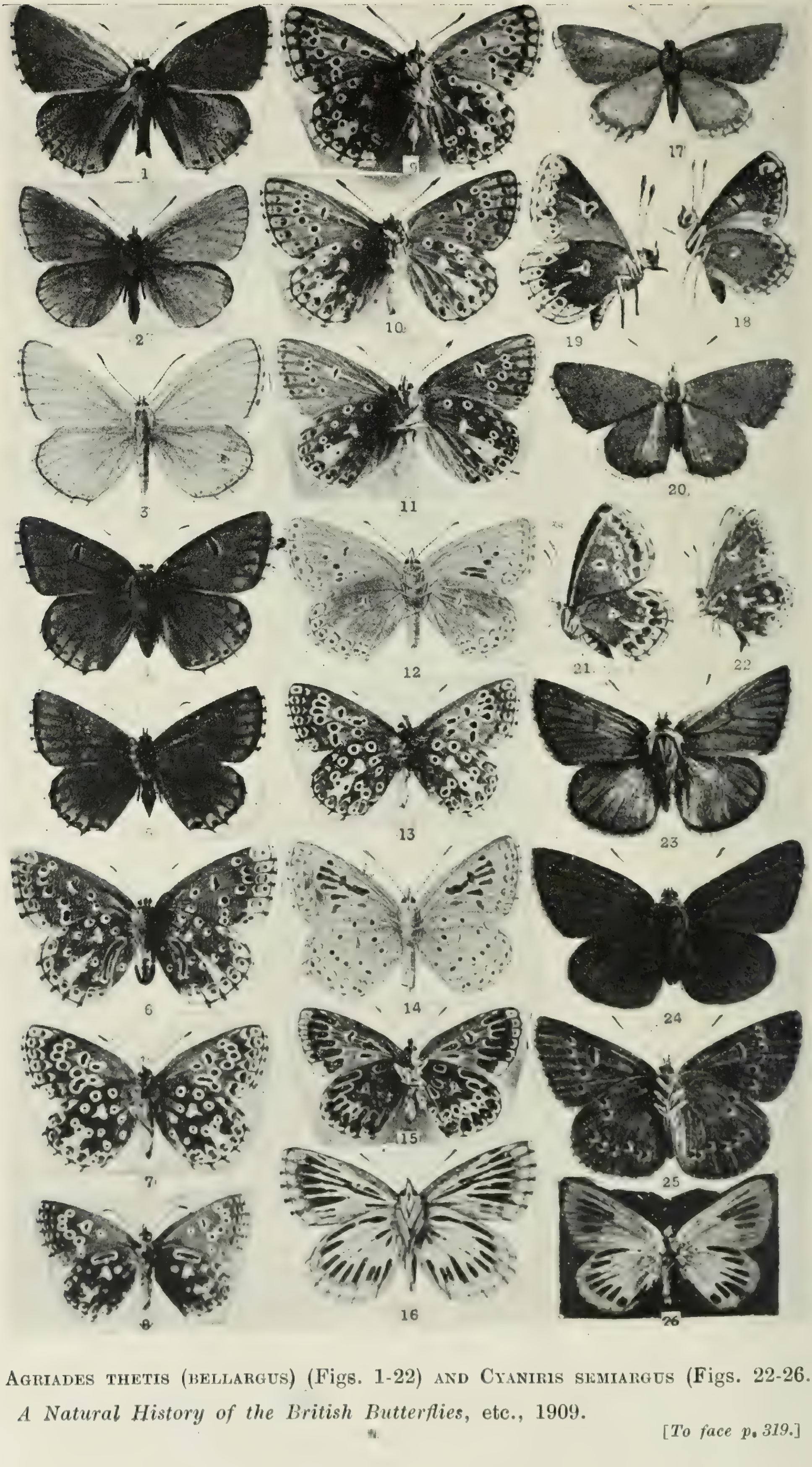
† This is given by Stephens as in Hants instead of Wilts.

Anhée, Warnant, near Arlon, etc. (Lambillion), Taviers (Wantier), Ortho (Slégers), Boussu-Walcourt (Hennin), Virton, Frameries (Derenne), the Ardennes—Grupont (Bath). Bosnia and Hercegovina: distributed and common up to 1200m.—on the Vlasic Planina, near Travnik (Nicholl), Sarajévo (Fountaine), Maklenpass, Vran planina, Dervent (Hilf), Jablonica, halfway up the Drinaca (Nicholl), Jaice, Pale, Bjelasnica, Treskavica (Apfelbeck), Celebic, Tro-vrh Zlijep (Sturany), Nevesinje, Gacko (Rebel), Lakat (Apfelbeck). Bulgaria and East Roumelia: in West Bulgaria, the Kirchenwald, Slivno (Rebel), the Vitoch, near Sofia, the Rilska valley, the Rhodope mountains, the Struma-Thal, Samakov (Nicholl), the Rilo Dagh, abundant to 7000ft. (Elwes). Corsica: Monte Pozzo di Borgo (Mann). Denmark: distributed and not rare (Bang-Haas). Finland: southern and middle, common, taken occasionally farther north, inside the Arctic Circle, to the shore of the Polar Sea, occurs also in Lapland (Federley). France: generally (Berce)—Ain—Divonne, the Faucille (Reverdin), Bellegarde (Austant); Aisne—woods of Holnon and Savy, Rouvray (Dubus), near Villers-Cotteret (Sheldon); Alpes-Maritimes—Cannes (Warburg), St. Martin-Vésubie, etc. (Rowland-Brown), Nice (Lang); Allier—Moulins (Peyerimhoff); Ariége—l'Hospitalet (Rowland-Brown); Aube (Jourdheuille); Aude—Carcanières (J. E. Jones); Basses-Alpes—Larche (Tutt), les Dourbes (A. H. Jones), Digne, Allos, Barcelonnette, etc. (Rowland-Brown), Prevessin (Muschamp); Basses-Pyrénées—generally (Rondou); Bouches-du-Rhône common (Siepi)—Aix-en-Provence (Fountaine); Bretagne—throughout (Griffith); Calvados—banks of the canal from Caen to the sea, Arromanche, Asnelles (Fauvel), Blainville, Ranville, not common (Moutiers); Cantal—le Lioran (Sand); Charente-Inférieure—Royan (Salis); Cher—Sologne, St. Florent (Sand); Côte-d'Or (Rehfous); Creuse—Guéret (Sand); Dordogne—rare, Jaures (Tarel); Doubs—Besançon (Bruand); Eure, rather scarce—Pont de l'Arche (Dupont); Eure-et-Loir—environs of Chartres (Guenée); Gironde—common (Rt. Brown); Haute-Garonne—Bagnères de Luchon (Bentall), St. Jean, Bouconne, banks of the Garonne (Aubusson); Haute-Marne—Langres, Latrecey, Hortes (Frionnet); Haute-Saône—near Luxeuil-les-Bains (Gibbs); Haute-Savoie —Grand Salève, Lavancher, the Brévent, Chavoire, Megève (Tutt), Chamonix, etc. (Rowland-Brown), Petit Salève (Reverdin); Hautes-Alpes, up to 7500ft. (Wheeler), Abriès, Crête de la Reychasse (Tutt), Mont Genèvre (Oberthür), Briançon (Forbes), le Lautaret (Hampson); Hautes-Pyrénées from 2000ft.-6000ft.—St. Sauveur (Elwes), Lac de Gaube Cauterets (Rowland-Brown), Gavarnie (Chapman), Héas (Bath); Indre—Brenne, rather common (Martin), Nohant (Sand); Indre-et-Loire—St. Avertin, environs of Tours (Meade-Waldo); Jura—very common, Arlay (Bentall); Loir-et-Cher—banks of the Loire at Blois, common (Chevillon), Chaumont (Moore); Loir-Inférieure—Nantes (Deherman-Roy); Lozère—Florac, Château-de-la-Caze, Mende, Balsièges, etc. (Rowland-Brown); Manche—environs of Cherbourg (Nichollet); Marne—Rheims, common (Demaison); Meurthe-et-Moselle—wood of Maxéville (Cantener); Nord—common on the dunes of Malo-les-Bains, Lille, etc. (Paux), Cambrai districts, Escaudœuvres (Brabant); Oise—forest of Compiègne (Boisduval); Pas-de-Calais—forest of Gûines (Gurney), Boulogne (Timins, *E.W.I.*, v., p. 115); Puy-de-Dôme—very abundant in the pastures of Mont Dore, rare elsewhere (Guillemot); Pyrénées-Orientales—le Vernet Montlouis (Rowland-Brown); Saône-et-Loire—rather rare in the Autun district (Constant), environs of Mâcon (André); Sarthe (Cnockaert); Savoie—Grésy-sur-Aix, St. Michel-de-Maurienne (Tutt); Seine—environs of Paris (Goossens); Seine-et-Marne—Fontainebleau (H. Brown); Seine-et-Oise—Maisons Lafitte, Lardy (H. Brown); Seine-Inférieure—common (Noel), on the hills opposite Sauchay (Moore); Somme (Frionnet); Var—Hyères, very scarce (Norris); Vaucluse—Brantes (coll. H. Brown); Vosges—St. Maurice-sur-Moselle, le Tholy, Charmes, Ballon d' Alsace (Gibbs); Yonne—common (Mabille). Germany: almost throughout the whole territory, from the lowlands up to the Alpine region, not rare in forest and mountain meadows (Speyer)—East and West Prussia, frequent—Braunsberg, Rastenburg, Willenberg (Schmidt), Rauschen, Warnicken, Wargen, Dammhof, Gross-Raum, Metgethen, Königsberg, Kleinheide, Gauleden, Tapiau, Wehlau, Insterburg, Pillkallen, Derkehmen, Wöterkeim, Mehlsack, Mohrungen, Osterode, Allenstein, Sorquitten, Goldap, Lyck, Johannisburg, Neidenburg, Kulm, Graudenz, Danzig, Karthaus, Alt Kischau, Lonsk, Jastrow (Speiser); Pomerania, common—Damm, near Schrey (Hering), Dänholm, Grubenhagen, Negast (Paul and Plötz), Isle of Usedom (Riesen), Pennin, Divitz Forest, near Barth (Spormann); Mecklenburg, distributed throughout—Neustrelitz, Sülze, Wismar (Boll), Neubrandenburg (Scharlau), near Friedland (Stange), Lübeck (Tessmann), Schwerin (Voelschow), in the Schlossgarten, on the Dreesch, Waren

(Busack), on the Kiebitzberg, near Waren (Schlange), sparingly at Parchim, Ludwigslust, Lübz, Plau (Gillmer), Eutin, near Casseedorfer-Gehege, not frequent (Dahl); Hamburg—Sachsenwald (Tessien), Borstel Moor, Niendorf (Zimmermann), Steinbeck, not frequent (Laplace); Isles of the North Sea—Sylt, singly (Werneburg), [Heligoland (Sélys-Longchamps), Dalla Torre believes that *C. argiolus* was mistaken for this species]; Hanover—Lüneburg, frequent (Machleidt and Steinvorth), Bremen, near Achim, Baden, rare (Rehberg), Hanover, in the Masch, rather rare (Glitz), between Herrenhausen and the Entenfang, near the Döhrener Turm, Laatzen, Seelhorst (Peets), Hameln (Jordan), Osnabrück (Jammerath); Westphalia—Höxter (Jordan), Münster (Gillmer); Rhine Provinces, frequent—Crefeld, the Rhine-meadows at Gellep, Budberg, Friemersheim, near Uerdingen, Bonn, Bingen, Aachen, Cöln, Elberfeld, Trier, Kottenforst (Stollwerck), Barmen, rare (Weymer), Neuenahr (Maassen), the Hülserbruch (Rothke); Hesse—Frankfort-on-Main, distributed, at the foot of Melibocus (Koch), Vogelsberg, Wetterau, Giessen, the Hinterland, etc., on Winterstein, etc. (Glaser), Wied-Selters (Schenck), Wiesbaden (Prideaux), the Taunus mountains, Braunfels, Bad Ems (Sich), near Bornich, Oberursel, not frequent, the Usthal, between Usingen and Ziegenberg (Fuchs), Hanau (Limpert and Röttelberg), Kaufunger Stiftswald, near Cassel, not rare (Borgmann), Rotenburg-on-Fulda, frequent (Jordan); Waldeck, throughout (Speyer); Thuringia, throughout, but rarer in the mountains (Krieghoff)—Arnsberg (Henze), Veronikaberg (Gillmer), Gera, not rare (*Ver. Lep. Gera*), Gotha (Rühl), Mühlhausen, not rare, Rudolstadt (Jordan); Zeitz-on-Elster (Wilde); Province of Saxony—Erfurt (Keferstein and Werneburg), Steigerwald, Willrodaerforst, singly (*Ent. Ver. Erfurt*), Naumburg, Nordhausen (Jordan); Anhalt, Harz, Brunswick, etc.—Dessau Haide, singly (Stange), the Wornitz (Gillmer), the Zerbst district, Lindau, Jütrichau Forest (Grauert), Oranienbaum Haide (Kunze), Mosigkau Haide (Amelang), Brunswick, Helmstedt, not rare (Heinemann), Wernigerode (Fischer), north-eastern border of the Hartz (Reinicke), Quedlinburg, Osterode, Göttingen (Jordan); Brandenburg, throughout—Berlin (Pfützner), Niederneundorf (Dadd), Neu Ruppin (Nürnberg), Frankfort-on-Oder, in the Seegründe, near Cunersdorf, on the Oder-banks, near Kornbusch (Kretschmer); Posen, common; Silesia—Gräfenberg (Neustädt), the Glätzer Gebirge (Dadd), the Seefeld, near Reinerz (Standfuss), the Trebnitz mts., the Bitke, frequent (Nohr), Upper Lusatia, common (Möschler), Siegersdorf (Sommer), Sprottau district, Seufzen, Mückendorf, Küpper, Sprottischdorf, Hochwald, Reuthau, Oberleschen (Pfitzner), the Görlitz Haide, Kohlfurt, Waldau distributed, but not frequent (Marschner); Kingdom of Saxony—Dresden, very frequent (Steinert), Saxon Upper Lusatia—Kommerau, Lieske (Schütze), Chemnitz district, rare, Markersdorf (Pabst), Leipzig, almost everywhere, Brandis, Universitätsholz, not rare, Reudnitz (*Ent. Ver. Fauna*), Leipzig district—Lausigk, Leisnig, not frequent, Rosswein, not frequent, Dresden district—Loschwitz, Lössnitz, Plauenscher Grund, Meissen, Sächsische Schweiz, frequent, Freiberg, rare, Bautzen district—Bautzen, not frequent, Kamenz, frequent, etc., Chemnitz district—Ebersdorf, Klaffenbach, Limbach, Crimmitschau, pretty rare, Werdau, not frequent, Plauen, Lengefeld, frequent, Annaberg, Schneeberg (*Ent. Ver. Iris*), Elster-in-Voigtland, Bärenloh, Kessel (Winkler); Bavaria—Berchtesgaden (Lang), Regensburg (Hofmann and Herrich-Schäffer), Wörth, Lappersdorf, Eulsbrunn, on the Madingerhöhen, Kelheim (Schmid), Munich, everywhere (Kranz), Augsburg, the Lech Plain, the Siebentischwald (Freyer), Kempten, frequent (v. Kolb), Reichenhall, the Fichtelgebirge, Kissingen (Rühl), Oberstdorf, the Seealp, Oythal, etc. (Dadd); Württemberg—Stuttgart, Tübingen, Reutlingen, in the Neckar, Jaxt, and Kocher valleys (Seyffer), Heidenheim-on-Brenz (Löffler); Baden, distributed—Constance, Freiburg, Höllenthal, Feldberg up to 3600ft., Ottoschwanden, Durlach (Reutti), Carlsruhe (Gauckler); Rhine Palatinate—Speyer (Linz and Bertram); Alsace—up to 900m. (Speyer). GREECE: Taygetos mountains (Kruper), Morea (Rebel), the Parnassus (Staudinger), Kalávryta district, near Delphi, Zachlaton (Fountaine), Rindomo, Hagia Lavrá (Holtz). ITALY: Liguria (Curò); Lombardy—Brianza, Alzate (Turati), Olgiate Molgora, Val Bregaglia (Fountaine), Chiesa, Chiavenna (Rowland-Brown); Piedmont—Pré St. Didier, Courmayeur, Mont de la Saxe, Val Véni, Val Ferrex, Aosta, Cogne Valley (Tutt), Susa (Rowland-Brown), Val Anzasca, Val Strona, Orta, above Sta. Maria on the Mt. Cenis Road, Certosa di Pesio (Lowe), Oulx (Forbes), Val Vigezzo—Villetti (Carlini), Val d'Antigorio (Blachier); Emilia—Modena, Reggio (Fiori); Tuscany, rather common throughout (Stefanelli)—Lucca—(Walker), Tuscan Appenines, Pistoiese Appenines — Migliorini (Verity), Vallombrosa, near Florence (Cecconi), Boscolungo (Norris), Elba, Sardinia

Plate XLII.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Agriades thetis (bellargus) (Figs. 1-22) and Cyaniris semiargus (Figs. 22-26.)

A Natural History of the British Butterflies, etc., 1909.

[*To face p. 319.*]

EXPLANATION OF PLATE XLII.

(*To be bound facing Plate XLII.*)

Fig. 1. AGRIADES THETIS ab. *puncta*, Tutt.
,, 2. ,, ,, ab. *hyacinthus*, Lewin.
,, 3. ,, ,, ab. *pallida*, Austin.
,, 4. ,, ,, ab. *albicincta*, Tutt.
,, 5. ,, ,, ab. *marginata* (poor figure), Tutt.
,, 6. ,, ,, ab. *basijuncta*, Tutt.
,, 7. ,, ,, ab. *semiarcuata* (right forewing) ab. *arcuata* (left forewing).
,, 8. ,, ,, ab. *costajuncta*, Tutt.
,, 9. ,, ,, ab. *atrescens*, with variable basal spots.
,, 10. ,, ,, ab. *fuscescens*, with variable basal spots.
,, 11. ,, ,, ab. *parvipuncta*, Tutt.
,, 12. ,, ,, ab. *biarcuata* (left forewing) ab. *postico-obsoleta* (hindwings), Tutt.
,, 13. ,, ,, ab. *addenda*, Tutt.
,, 14. ,, ,, ab. *partimradiata*, Obth.
,, 15. ,, ,, ab. *conjuncta*, Tutt.
,, 16. ,, ,, ab. *striata*, Tutt.
,, 17-18. ,, ,, ab. *obsoleta*, Tutt (copied from Hübner's figs.645-6).
,, 19. ,, ,, ab. *obsoleta*, Tutt (copied from Herrich-Schäffer's fig. 248).
,, 20-21. ,, ,, ab. *cinnus*, Staud. (*nec* Hb.) (copied from Hübner's figs. 698-9).
,, 22. ,, ,, ab. *antico-obsoleta*, Tutt.
,, 23. CYANIRIS SEMIARGUS, ♂.
,, 24. ,, ,, ♀.
,, 25. ,, ,, underside.
,, 26. ,, ,, ab. *striata*, Tutt.

(Curò); Abruzza (Calberla); Sicily, common up to 1700m.—Madonie, Fontanelle, Palermo, Monte Medio, Monreale, Caronia, Ficuzza (Minà-Palumbo), Etna (Zeller), Zafferia, near Messina (Fountaine), Medda, Moglia (Calberla), Castelbuono (Gianelli). MONTENEGRO: Durmitor (Hilf). NETHERLANDS: Limburg, North Brabant, St. Michielsgestel, Gelderland, near Zutphen, Varsseveld, Aalten, in Arnhem (Snellen). PORTUGAL: near São Romão (Eaton). ROUMANIA: Tultscha (Mann), Kloster-Neamtz, Tschochleu, Costischa, Azuga, Valeni, Dulcesti, the Bucovina, Grenzgebirge, Comanesti, Turn Severin (Fleck). RUSSIA: Baltic Provinces—Riga district (Teich), the Dwina delta (Hertz), St. Petersburg Government (Sievers); Government Wiatka, common—Sarapoul, etc. (Kroulikowsky); Government Poltawa (Markoff), Government Pskov (Kusnezow); Government Moscow—near Moshaish, Svenigorod, very rare, near Tambov, somewhat common (Assmuss); Ural district—Miashk (Grum-Grshimailo, Brit. Mus. coll.), Kasan and Orenburg districts, very common (Eversmann), Kasan, Mariinsky-Possad (Kroulikowsky); Caucasus (Romanoff), Central Caucasus (Schaposchnikov); Transcaucasia, everywhere—Börjom, etc. (Romanoff). SCANDINAVIA: throughout, to the shores of the Polar Sea (Federley), to 63°N. lat. (Aurivillius); Norway, south, west, and central, sparingly—Christiania, common, Edsberg, Lund, Hoff, Aamot, Laurgard-in-Sell, Gudbrandsdal, Modrun, Odalen, common, Naes Vaerk, rare (Siebke), Smaalenene, Akershus, Hedemarken, Buskerud, Bratsberg, Jarlsberg Laurvik, Nedenaes, Lister, Mandal, Romsdal, S. Trondhjem (Schöyen), Bolkesjo, between Disenaen and Saeterstoen (Standen), Saeterstoen (Chapman), Sireosen (Strand); Swedish Lapland—Luleå (66°N. lat) (Duurloo). SPAIN: Asturias—Bilbao, rare (Seebold); Aragon, not common (Nicholl), Teruel district, Alcaniz, Casa Nueva, Cerro Moro, Cerro Cortes (Zapater), Albarracin, Camarena (Korb), Moncayo, Canales (Chapman); Andalusia—Granada district, Alfakar (Rambur), Granada (Nicholl); Leon—Sierra de Bejar (Chapman); Catalonia—Mont Sény, near Barcelona (Witty); Old Castile—Guadarrama mountains, La Granja (Sheldon). SWITZERLAND: up to 8000ft., Geneva—Chambésy, Bois des Frères, Versoix, Hermance (Reverdin), Mt. Reculet, St. Cergues (Blachier); Berne—the Blumenthal (Wheeler), Interlaken district (Renshaw), Wengen district (Moss), Engstlen (Bethune-Baker), near Weggis (Sandford), Kandersteg (Rosa), Kienthal, Schynige Platte (Reverdin), Grindelwald, Aarberg, Tramelan, Macolin (Lowe); Glarus—Glärnisch, Obersee (Muschamp); Freiburg—Gruyères (Rowland-Brown); Gallen—Wesen (Lowe); Grisons—Wörmser Joch above Santa Maria, Münster-Thal, Dischma-Thal, Glaris, Spinabad, Fluela Pass, between Lavin and Guarda, Ofen Pass, above Zernetz, Preda, Weissenstein (Tutt), Silser-See, Promontogno (Fountaine), St. Moritz, Pontresina (Nicholson), Val Fex (Elwes), Thusis to Splugen (Rowland-Brown), Heuthal, Samaden (Lowe); Lucerne—Lucerne (Lemann); Schwyz—Brünnen (Tutt coll.); Ticino—the St. Gothard slopes above Airolo, between Airolo and Piotta (Tutt), Chiasso district, Bisbinno (Knecht), Altanca (Blachier), Locarno (Chapman), Lugano (Jones), Campolungo (Muschamp), Fusio (Chapman); Unterwalden—Engelberg (Bethune-Baker); Uri—Maderaner-Thal (Lang), Göschenen, Andermatt (Tutt), between Wassen and Göschenen (Keynes), Oberalp Pass (Wheeler), Furka Pass (Lang); Valais—Salvan (Prideaux), Vernayaz (Sheldon), Dent du Midi, Col Ferret (Muschamp), Martigny, La Bâtiaz, Champéry, Chatel (Wheeler), Great St. Bernard, Ravoire, Arpilles, Bovine, Mt. Chemin, Fully, Saillon, Sierre, Vissoye, Zinal, Loèche-les Bains, Sion, Visp, Stalden, St. Nicolas, Zermatt, Görnergrat, Triftalp, Zmutt-Thal, Bérisal, Steinenthal, Simplon, Gondo (Favre), the Kaltwasser Gallery (Keynes), Schallberg (Reverdin), Ganter, Alpien, Rossboden Alp (Rehfous), Riffelberg (Jordan), Almagel (Reverdin), Val de Bagnes, Fionnay, Laquinthal, Binn (Blachier), St. Laurent (Rowland-Brown), Alp Arpitetta (Wheeler), Val d'Hérens—Arolla, Haudères, Satarme, Bricolla Alp, Useigne to Evolène, Saas-Thal—Saas-Fée, Saas-Grund, Mattmark (Tutt), Sierre and Evolène (Pearson); Vaud—the Jura—St. Georges, near Sonzier (Wheeler), Eclépens (Lowe), Jouxtal, Mt. Tendre, Turfmoor of Sentier (Mory), Luan, above Corbeyrier (Sloper), Aigle (Tasker), Bex, etc. (Murray), Les Avants (Wheeler), Col de Jaman, Rochers de Naye (Rowland-Brown), near Villars (Moss), Veytaux, the Tiniére valley (Wheeler), Roche, Yvorne (Tutt), Château d'Oex (Tetley), Glion (Fountaine), Caux (Lowe), Sépey, Leysin (Lowe), Gorge du Chauderon (Barraud). TURKEY: Port Baklar, about 12 miles from Gallipoli (Mathew), near Constantinople (Keferstein).

Genus: AGRIADES, Hübner.

SYNONYMY.—Genus:—**Agriades,** Hb., "Verz.," p. 68 (1816-18); Stphs., "Illus. Haust.," iv., app. p. 404 (1834); Stphs., "List Brit. Lep.," 1st ed., pp.

19, 261 (1850); Kirby, "List Br. Lep.," p. 3 (1858); Tutt, "Ent. Rec.," xviii., pp. 131-132 (1906); "Nat. Hist. Brit. Lep.," viii., p. 313 (1906); "Ent. Rec.," xxi., p. 108 (1909). **Papilio,** Scop., "Ent. Carn.," p. 179 (1763); Schiff., "Schmett. Wien.," 1st ed., p. 184 (1775); Harris, "Eng. Lep.," p. 2 (1775); Schneid., "Sys. Besch.," pp. 239, 245 (1785); Bkh., "Sys. Besch.," i., pp. 158, 162, 277, 279 (1788); ii., pp. 226, 227, 228 (1789); Lang, "Verz.," 2nd ed., pp. 52-53 (1789); Scriba, "Journal," pp. 211, 221 (1791); Bkh., "Rhein. Mag.," i., p. 286 (1793); Don., "Brit. Ins.," vii., p. 53, pl. 236, figs. 1-1*a* (1795); Lewin, "Ins. Gt. Brit.," pp. 76, 80 (1795); Hb., "Eur. Schmett.," lix., figs. 286-7; pl. lxi., figs. 295-300 (1796); pl. cxxvii., figs. 645-6 (1808); pl. cxxxviii., figs. 698-9 (*ante* 1816); "Raup.," Pap. II., pl. xxxvii., figs. 1*a-c* (? 1800); Ill., "Schmett. Wien.," 2nd ed., pp. 269, 270 (1801); Hoffmsgg., "Ill. Mag.," iii., pp. 184, 189, 190 (1803); Lasp., "Ill. Mag.," iv., p. 63 (1804); Herbst, "Nat. Syst. Ins.," xi., pp. 201, 213, 230 (1804); Hb., "Eur. Schmett.," text, pp. 47, 49 (*circ.* 1805); Ochs., "Schmett. Sachs.," pp. 318, 323 (1805); "Die Schmett.," i., pt. 2, pp. 28, 33 (1808). **[Papilio-]Plebeius,** Poda, "Mus. Graec.," pp. 77-78 (1761). **[Papilio-Plebeius-]Ruralis,** Rott., "Naturf.," vi., pp. 24, 25 (1775); Esp., "Schmett. Eur.," pp. 333, 335 (1777); pl. xxxii. (supp. viii.), fig. 3 (1777); pl. xxxiii. (supp. ix.), fig. 4 (1777); pl. li. (cont. i.), fig. 4 (1778); pl. lv. (cont. v.), figs. 1, 2, 3, 4, 6 (1778); p. 30, pl. xc. (cont. xl.), fig. 2 (1786); pl. cii. (cont. lvii.), fig. 1 (1787); Bergstr., "Nomen.," iii., pp. 3, 4, 5, 10, 17, 35, pl. xlix., figs. 1-2; pl. l., figs. 1-4; pl. liii., figs. 5-6; pl. lix., figs. 5-8 (1779); Göze, "Ent. Beit.," iii., pt. 2, pp. 67, 73 (1780); Fab., "Mant. Ins.," i., pp. 74, 75 (1787); Rossi, "Fn. Etrusc.," ii., p. 156 (1790); Schwarz, "Raup. Kal.," ii., p. 347 (1791); Haw., "Lep. Brit.," i., pp. 44, 45 (1803): Ill., "Rossi's Fn. Etrusc.," ii., p. 247 (1807). **[Papilio-]Ruralis,** de Vill., "Car. Linn. Ent. Fn. Suec.," ii., pp. 74, 75 (1789). **[Hesperia-]Ruralis,** Fab., "Ent. Syst.," iii., pt. 1, pp. 298, 299 (1793); Panz., "Schäff. Icones," 2nd ed., p. 109, pl. xcviii., figs. 4, 5 (1804). **Cupido,** Schrank, "Fauna Boica," ii., pt. 1, pp. 212-3 (1801); Kirby, "Syn. Cat.," pp. 367, 368 (1871); Auriv., "Bih. Svensk. Vet. Ak. Handl.," v., p. 24 (1880). **Hesperia,** Panz., "Schaff. Icones," 2nd ed., pp. 183, 216, pl. 214, figs. 1-2; pl. 276, figs. 1-2 (1804). **Polyommatus,** Latr., "Hist. Nat. Crust.," xiv., pp. 118, 119, pl. xiv., figs. 1-2 (1805); "Gen. Crust. Ins.," iv., p. 208 (1809); "Enc. Méth.," ix., pp. 614, 615 (1819); Godt., "Enc. Méth.," ix., p. 691 (1819); "Pap. Fr.," i., pp. 208, 210, pl. xi *tert.*, figs. 1, 2; pl. xi. *sec.*, figs. 1, 2 (1821); Curt., "Brit. Ent.," v., fo. 6 (1824); Stphs., "Illus. Haust.," i., pp. 88, 89 (1828); "Ins. Cat.," 1st ed., ii., p. 23 (1829); Bdv., "Eur. Lep. Ind.," p. 12 (1829); Meig., "Eur. Schmett.," ii., pp. 19, 21, pl. xlvii., figs. 1, 3*a-b* (1830); Ramb., "Fn. And.," pp. 272-3 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., figs. 65-6 (1839); Westd., "Syn. Gen.," ii., p. 88 (1840); Humph. and Westd., "Brit. Butts.," pp. 105-6, pl. xxxiii., figs. 1-8 (1841); Stphs., "List," 1st ed., p. 19 (1850); 2nd ed., p. 18 (1856); Sta., "Man.," i., p. 60 (1857); Hein., "Schmett. Deutsch.," i., p. 79 (1859); Kirby, "Man.," p. 107 (1862); "Eur. Butts.," i., p. 48, pl., xiv., figs. 6-7 (1882); Buckl., "Larvæ," etc., i., pp. 106, 191, pl. xiv., fig. 3., pl. xv., fig. 1 (1885); Dale, "Hist. Brit. Butts.," pp. 63, 66 (1890); Barr., "Lep. Br. Is.," pp. 81, 85, pl. xiii., figs. 1-1*f*; pl. xii., figs. 1-1*e* (1893); Tutt, "Brit. Butts.," pp. 166, 170, pl. ii., figs. 12-13; pl. iii., figs. 1-2 (1896); "Ent. Rec.," vii., pp. 220, 300 (1896); Kirby, "Handbook," etc., ii., pp. 91, 93, pl. xlvi., figs. 1-3; pl. xlvii., figs. 5-6 (1896); Grote, "Schmett. Hildesh.," p. 42 (1897); Reuter, "Ent. Rec.," x., p. 97 (1898); Wheeler, "Butts. Switz.," pp. 31, 32 (1903). **Lycaena,** Fab., "Ill. Mag.," vi., p. 286 (1807); Oken, "Lehrb.," ii., p. 719 (1815); Leach, "Edinb. Enc.," ix., pt. 1, p. 129 (1815); Ochs., "Die Schmett.," iv., p. 25 (1816); Sam., "Ent. Comp.," pp. 26, 241 (1819); Koll., "Verz. Schmett. Oestr.," p. 8 (1832); Tr., "Die Schmett.," x. supp., pp. 67, 68, 235, 236 (1834); Freyer, "Neu. Beit.," iii., p. 45, pl. 223, fig. 1 (1836); vi., p. 13, pl. 487, figs. 1-2 (1852). Bdv., "Gen. et Ind. Meth.," pp. 10, 12 (1840); Neüst. and Korn., "Schmett. Schles.," pt. i., pp. 46, 47; pls. xxi.-xxii. (1842); H.-Sch., "Sys. Bearb.," i., p. 121 (1845); Evers., "Fn. Volg.-Ural.," p. 50 (1844); Dup., "Cat. Méth.," p. 33 (1844); Nick., "Lep. Fn. Böhm.," p. 14 (1850); Heyd., "Cat. Lep. Eur.," p. 14 (1851); Meyer-Dür, "Schmett. Schweiz.," pp. 82, 85 (1851); Westd. and Hew., "Gen. Diurn. Lep.," ii., p. 493 (1852); Led., "Verh. zool.-bot. Gesell.," ii., p. 20 (1852); Wallgrn., "Skand. Dagf.," p. 223 (1853); Gerh., "Mon. Schmett.," p. 17, pl. xxx., figs. 1, 2, 4 (1853); Ménét., "Cat. Mus. Petr.," pp. 57, 58 (1855); Koch, "Schmett. Deutsch.," p. 29 (1856); Ramb., "Cat. Lep. And.," pp. 41, 42 (1858); Speyer, "Geog. Verb. Schmett.," i., p. 85 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Zebr., "Lep. Krak.," p. 157 (1860); Staud., "Cat.," 1st ed., p. 5 (1861); Rössl., "Schmett. Nass.," pp. 115, 116 (1866); Berce, "Fn. France," i., p. 142, pl. vi., fig. 8 (1867); Nolck., "Lep. Fn. Estl.," i., p. 57 (1868); Butl., "Cat. Diurn. Lep.," p. 170 (1869); Staud., "Cat.," 2nd ed., p. 12 (1871); Mill., "Cat. Lép. Alp.-Mar.," p. 103 (1871); Newm., "Brit. Butts.," pp. 129, 131, figs. 43, 44 (1872); Bang-Haas, "Nat. Tids.," 3rd ser., ix., p. 395 (1874); Curò, "Bull. Soc. Ent. Ital.," vi., p. 112 (1874); Cuní-y-Mart., "Lep. Barc.," pp. 18, 20 (1874); Scudd., "Hist. Sketch," p. 209 (1875); Sand, "Lép. Ber. Auv.," p. 6 (1879); Frey, "Lep. Schweiz," p. 19 (1880); Peyerim., "Lép. Als.," p. 24 (1880); Rössl., "Lep. Wiesb.," p. 30 (1881); Jourdh., "Lép. Aube," p. 18 (1883); Lang, "Butts. Eur.," pp. 120, 121, pl. xxvi., figs. 4-6 (1884); Lampa, "Ent. Tids.," vi., p. 14 (1885); Kane, "Eur. Butts.," p. 44, pl. iv., fig. 7 (1885); Kill., "Ins. Graüb.," p. 20 (1886); Auriv., "Nord. Fjär.," pp. 14, 15, pl. vi., fig. 6 (1888-1891); Brom., "Lep. Riv.," p. 39 (1892); Rühl, "Pal. Gross.-Schmett.," i., pp. 275, 276 (1892-5); Meyr., "Handbook," p. 348 (1895); Favre, "Macr.-Lép. Val.," p. 20 (1899); Staud., "Cat.," 3rd ed., p. 86 (1901); Fleck, "Macr.-Lep. Rumän.," p. 21 (1901); Lamb., "Pap. Belg.," pp. 235, 238 (1902); South, "Brit. Butts.," pp. 167, 170, pl. cix., figs. 1-12, pl. cx., figs. 1-11 (1906). **[Zephyrus-] Cyaniris,** Dalm., "Handl.," pp. 94, 97 (1816); **Argus,** Bdv., "Icones Chen.," ii., figs. 1-5 (1832); Dup., "Pap. Fr.," supp. i., p. 389 (1832); Cant., "Lép. Var," p. 6 (1833). **Cyaniris,** Vill. and Guén., "Tab. Syn. Lep. Eur.," pp. 19, 20 (1836). **[Polyommatus-] Agriades,** Stphs., "List," 1st ed., p. 19 (1850). **Nomiades,** Kirby, "List Br.-Lep.," p. 3 (1858).

The genus *Agriades*, as we understand it, consists of a very few closely-allied species, of which *thetis* (*bellargus*) and *coridon* are the best-known. They are recognised almost at sight by their general appearance as well as, usually, by the strongly-chequered, black and white, fringes; the ♀ s particularly are similar, and, according to some lepidopterists, are sometimes difficult to distinguish, the similarity extending to the ground colour and spotting of the underside, but we find it hard to believe that any careful student need be troubled by this similarity. The genus *Agriades*, as originally described by Hübner (*Verz.*, pp. 67-68), was a most heterotypical group, his description reading as follows:—

The wings entirely bright blue, the underside adorned with red marginal spots—*Agriades daphnis*, Schiff., "Verz. Pap.," N. 2 and *endymion*, N. 1; *meleager*, Esp., "Pap.," 45, 2; Hübn., "Pap.," 280-282. *A. cajus*, Cram., 319 D.E. *A. panoptes*, Hübn., "Pap.," 670-673; *zachaeus* (?), Herbst, 311, 9-10. *A. argiolus*, Linn., "Syst. Pap.," 234; *acis*, Fabr., "Mant. Pap.," 687; *cleobis*, Esp., "Pap.," 40, 3; Hübn., "Pap.," 272-274. *A. ladon*, Cram., 270, D.E., and *mycilus*, 282, F.G. *A. admetus*, Esp., "Pap.," 82, 2-3; Hübn., "Pap.," 307-309. *A. orbitulus*, Prunn., "Lepid.," 158; *meleager*, Hübn., "Pap.," 522-525 and 761-762. *A. corydon*, Schiff., "Verz. Pap.," N. 10; Hübn., "Pap.," 286-288. *A. dorylas*, Schiff., "Verz. Pap.," 19; *hylas*, Esp., "Pap.," 45, 3; Hübn., "Pap.," 289-291. *A. adonis*, Schiff., "Verz. Pap.," N. 11; *bellargus*, Esp., "Pap.," 32, 3; Hübn., "Pap.," 295-297. *A. golgus*, Hübn., "Pap.," 688-689. *A. agestis*, Schiff., "Verz. Pap.," N. 13; Hübn., "Pap.," 303-306. *A. eumedon*, Esp., "Pap.," 52, 2-3; Hübn., "Pap.," 301-302 and 700-701. *A. icarius*, Esp., Pap.," 99, 4; *amandus*, Hübn., 283-285 and 752-755.

The species here enumerated comprise, practically, representatives of the greater part of the genera comprised in our tribe *Plebeiidi* (*anteà*, p. 154-157), but, in addition, also the Celastrinids (*Celastrina argiolus*), whilst *panoptes* belongs to Hübner's next group (*Scolitantides*), which he evidently failed to recognise in *hylas*, Schiff. (*amphion*, Esp.), a synonym of the same species which he rightly places. In 1835, Stephens, in the appendix to *Illus. Brit. Ent. Haust.*, iv., p. 404, uses the name for *argiolus*, *corydon*, *dorylas*, *adonis*, *alexis*, *agestis*, and *icarius;* whilst, in 1850, he further restricts it (*Cat. Br. Lep.*, p. 19) to *corydon*, *adonis*, and *alexis*, this time excluding *argiolus* and *agestis*. In 1858, Kirby, in his *List of Brit.*

Rhopalocera, p. 3, places in it *argiolus*, *corydon*, *alexis* (*agestis*), and *artaxerxes* (*salmacis* and *artaxerxes*), whilst he refers *adonis* to *Nomiades*. In 1875, Scudder (*Hist. Rev.*, p. 105) discusses the name *Agriades*, mentioning most of the facts noted above, and concludes "The species mentioned by Stephens and Kirby seem to belong to the earlier *Rusticus*, and hence have no effect; *orbitulus* may be taken as the type." This, of course, is not so, both Stephens' and Kirby's *Agriades* are heterotypical, and the species which these authors place in *Agriades* do not, as Scudder says, belong to *Rusticus* (type *argyrognomon*); the restriction of Stephens, therefore, renders Scudder's action, in 1875, of fixing *orbitulus* as the type, *ultra vires*, and, in accordance with Stephens' restriction, we have suggested (*anteà*, viii., p. 313) *coridon* as the type. The restricted genus is the sect. *B* of Herrich-Schäffer's *Lycaena* (*Sys. Bearb.*, i., pp. 111 *et seq.*) as noted, *anteà* vol. viii., pp. 309-310, and is described as—

I. Alæ posteriores ecaudatæ.
    2. Subtus ante limbum maculæ rufæ.
        A. Inter lunulam mediam et basin alarum anteriorum ocellus unus aut alter.
            A. Ocellus cellulæ 6 alarum posteriorum linea recta inter ocellos cellulæ 5 et 7 positus.
                b. Alæ posteriores subtus inter seriem ocellorum et maculas limbales cellulæ 3 et 4 albæ.
                    β. Ciliæ (saltem in alis anterioribus) nigro-notatæ, alæ posteriores subtus anterioribus paullo obscuriores—*corydon*, F., *adonis*, F.

Herrich-Schäffer's limitation is practically ours. At present we are inclined to place no other European species therewith, although *meleager* was included, *anteà* p. 155, and is somewhat doubtful. The further range of the group has still to be determined. It is very closely allied, indeed, to *Polyommatus*, though the genitalia of the two groups are somewhat different (see *anteà* p. 157, pl. xxi., figs. 3, 4; pl. xxii., figs. 3, 4). The genitalic characters are, however, very different from those of *Plebeius* as illustrated by *P. argus* (*aegon*) (see pl. xx., figs. 1, 2, 3; xxi., figs. 1 and 4; xxii., figs. 1 and 4).

The Agriadid egg is larger than that of any of the other British Plebeiids, except that of *Plebeius argus* (*aegon*). It is somewhat characteristic in that the reticulation is particularly coarse and open on the outer edges of the egg, whilst the upper surface is more absolutely flat than in the eggs of the closely allied groups, and is covered with a finer network that contrasts strongly with that of the outer ring of the egg. The Polyommatid egg has the upper surface of the egg reticulated with cells very similar to those of the outer edges.

The Agriadid larva is very characteristic compared with those of the rest of our British Lycænids, even in a tribe where the larvæ are so much alike. It is particularly marked by the extensive development of the dorsal ridges and lateral flanges, which give it a very characteristic appearance. In their food- and feeding-habits the larvæ of our two British species are exceedingly alike, being largely confined to the same foodplant, *Hippocrepis comosa*, and preferring leaves to flowers, but, in their other habits, they are entirely different, *Agriades thetis* producing a large number of "forwards," so as to be almost regularly double-brooded, whilst, except in one or two spots in the most southern parts of its range, *Agriades coridon* is a purely single-brooded species, and, whilst *A. thetis* hybernates in the normal fashion of the Plebeiid larva in its third instar, *A. coridon* hybernates as an unhatched larva inside the eggshell. It is probably in this physiological peculiarity that we have to seek for one of the causes of the maintainance of two such closely allied species, with an almost identical limitation of range, and largely confined to the same foodplant.

The Agriadid pupa (as represented by those of *Agriades thetis* and *A. coridon*) is rather less broad and short proportionally than the Cyanirid pupa (as illustrated by that of *Cyaniris semiargus*). It is also denser, thicker, and more coloured than that of *Cyaniris*. The pupa-skin of *C. semiargus* is of a very delicate texture, thin and transparent (almost filmy), whilst those of *Agriades thetis* and *A. coridon* are comparatively dense, the skin (apart from the appendages, wings, etc.) quite brown-tinted in *A. thetis*, though less coloured in that of *A. coridon*. The abdominal pocket situated between the 4th and 5th abdominal segments, for the end of the maxillæ, and noted *anteà* p. 226, as specially well-developed in *Plebeius*, and comparatively rudimentary in *Cyaniris* (*semiargus*) (p. 252), is fairly well developed in *Agriades* (*thetis* and *coridon*). The Agriadid pupa (*thetis* and *coridon*) is without definite cremaster, and has no cremastral hooks, although the cremastral area carries some ordinary hairs, which are not, however, homologous with the cremastral hooks; the Cyanirid pupa (*semiargus*) has a cremaster of quite normal structure, although the hooks are very sparsely developed. Both the Agriadid and Cyanirid pupæ are essentially naked, but the former has quite a number of hairs round the spiracles to compare with the one or two of the latter (Chapman).

The range of the two species included in this genus is very limited, being confined in each case to central and southern Europe. They both extend to the Asia Minor and Caspian districts, but not beyond Persia, nor do they apparently enter Asia beyond the Urals. *A. thetis* (*bellargus*) extends into Mauretania, but *A. coridon* has not yet been reported as occurring on the southern shores of the Mediterranean. It is also a remarkable fact that, in its most western limits, *A. coridon*, in the so-called form *polonus*, Zell. (but really the form *polona*, Gerhard), is so like *A. thetis* (*bellargus*) in certain superficial characters of colour, etc., that Staudinger treats it (*Cat.*, 3rd ed., p. 86) as a var. of *bellargus*, and then notes it as "*corydon* var. *caucasicae* valde similis." It is very rarely that two so closely allied species show such a near parallelism in their range and habits. The question of hybridity between the two common Agriadid species has already been broached. On May 20th, 1893, we captured at Cuxton a ♂ example of a "blue" that, in shape, size, and general appearance, might be *coridon*, but which, in colour, approaches *thetis* (*bellargus*). It was at the time paired with an ordinary ♀ *thetis* (*bellargus*) (which it carried when they were disturbed), and was flying among hundreds of quite typical *thetis* (*bellargus*), no specimen of *coridon* being seen, nor, indeed, did *coridon* appear in this locality that year till a month later. As late examples of *coridon* and the early examples of *thetis* (*bellargus*) frequently occur together at the end of August and early September in this locality, we concluded that the specimen was a hybrid between these species, retaining the form, size, etc., of *coridon*, but having the scales and colour modified in the direction of *thetis* (*bellargus*).

It would have been easy to have assumed it to have been a blue aberration of *coridon*, such as occurs racially in Spain and Asia Minor, but the metallic lustre of the scales, and the ensemble of the specimen led us to exhibit it at the meeting of the Ent. Soc. of London, April 11th, 1894, as a hybrid ♂ of *coridon* × *bellargus*. The second specimen of this form that we saw was one almost the counterpart of our own, exhibited by Dadd at the meeting of the Ent. Soc. of London, October 21st, 1908, and noted (*Proc. Ent. Soc. Lond.*, 1908, p. lxiii) as a hybrid *corydon* × *bellargus*, captured at Airolo, June, 1907, flying with *bellargus*, which was very common in the locality at the time it was captured. The next doubt that occurred to our mind arose from the statement of Keynes (*Ent. Rec.*, xx., p. 178) that, on June 25th, 1907, he captured in the Vallée du Lys "two fine specimens of *Polyommatus corydon* var. *corydonius*, a variety" which he had "not seen previously recorded from the French Pyrenees; the colour of these specimens is quite different from the type, approaching that of *bellargus*, though the underside is typically *corydon;* at first, indeed, we took it for a variety of *P. bellargus* which was common everywhere: there was not a single specimen of *corydon* (type) to be seen here, nor did we meet with it elsewhere in the Pyrenees." Light broke on the subject when we were critically overhauling the material in the British Museum coll. Here, a specimen labelled "Shar Deresy, Leech coll." was observed, exactly characteristic of the specimens already noted, and as entirely different from the local form of *coridon*, which is here of a pale lavender colour, as it is from *thetis* (*bellargus*), which is brilliantly typical. Then, at the head of a long series of specimens labelled *polonus*, was a specimen strikingly different from all the others in the series, the counterpart of the just-described examples, the same silvery or metallic *bellargus* blue, and bearing this illuminating legend in Zeller's handwriting "*Polonus*, 'S.E.Z.,' '45, 351. *Corydonius*, H.-Sch. Zell. coll.," *i.e.*, it was Zeller's type *polonus*. Here history repeats itself, for, turning to Zeller's original account (*Stett. Ent. Zeit.*, 1845, p. 351), we read that he discovered in Loew's collection, made in Posen, two strange-looking "blues," that Loew kept one and gave him the other (the one now in the British Museum coll.), that after three years Loew failed to find another, that then he received a figure of another exactly similar example taken near Frankfort-on-Main, and supposed by the captor and Metzner to be a variety of *corydon*, an opinion which, however, Zeller says he could not endorse, and he then describes it as *polonus*, noting it as "midway between *adonis* and *corydon*, and were it not for the fact that three quite similarly-coloured and marked examples on the upperside are known to me, I might be pardoned for thinking that it is a hybrid having on the upperside a ground colour combining the blue of both species, but with the marginal markings of *corydon*, whilst on the underside the colouring and marking is that of *adonis*." Zeller then gives an excellent comparative description of *polonus* and the two parent species, which, in the light of our present ignorance, is really very remarkable. Herrich-Schäffer then figured (*Sys. Bearb.*, i., pl. xci., figs. 432-3) without any description, an insect under Zeller's name, *polona*, but in the supp. p. 27, says that the figure was made from a ♂ received from Zeller (so that, apparently, Zeller's description and Herrich-Schäffer's figure refer to the same example). Herrich-

PLATE XLIII.

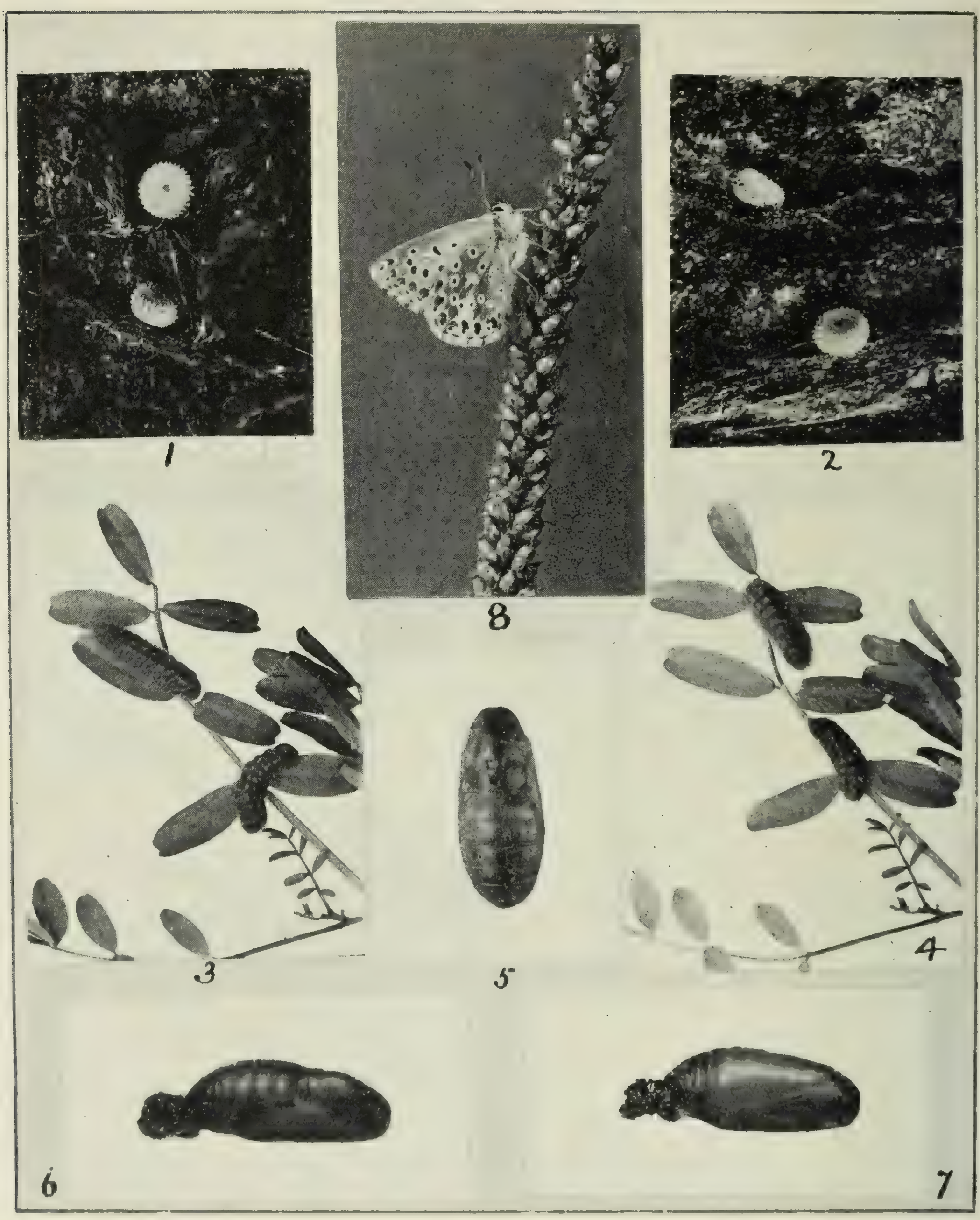

*Photo. **H.** Main and **A. E.** Tonge.*

AGRIADES THETIS (BELLARGUS).

FIGS. 1-2.—OVA × 10. FIGS. 3-4.—LARVÆ (NAT. SIZE).
FIGS. 5-7.—PUPA (DORSAL, LATERAL, AND VENTRAL VIEWS) × 2.
FIG. 8.—IMAGO, ♀ (NAT. SIZE).

A Natural History of the British Butterflies, etc., 1909.

[To face p. 325.]

Schäffer was followed by Gerhard (*Mon.*, p. 21, pl. xxxvii., figs. 4*a-b*) with the habitat "Turkei," probably Turkey-in-Asia, and, therefore, his insect referable to the blue form of *A. coridon*, followed in turn by Staudinger, who notes (*Hor. Soc. Ent. Ross.*, xiv., p. 244) the capture of a ♂ *polonus* on June 23rd, 1875, at Kerasdere, in Asia Minor, flying with typical *A. thetis* (*bellargus*), and then, unfortunately, mixes it up with the blue form of *A. coridon* that Lederer took in the Taurus. He also notes (*op. cit.*) another possible specimen of *polonus* captured on the Pomeranian border of Silesia, and supports Zeller's view of a hybrid origin for this form. With this information at disposal, and knowing that Zeller's original types came from Germany, he gives, in 1871 (*Cat.*, 2nd ed., p. 12), however, the only locality of *polonus* as "Asia Minor," and from this blunder has spread the general error of referring all the blue forms of *coridon* from Asia Minor and Spain to *polonus*, Zell., and to the culminating blunder in Staudinger's *Cat.*, 3rd ed., p. 86, where he gives as the range of Zeller's *polonus*, "Eastern Prussia, Aragon, Taurus, Syrian mountains," and considers the combination a variety of *bellargus*. The Aragon, Taurus, and Syrian specimens of *polonus* sent out by Staudinger, that we have been able to examine, are all undoubted "blue" examples of *coridon*, whilst we can find none other than the specimens* noted above that can be referred to *polonus*, Zell. These, we suspect, are real natural hybrids of *coridon* × *thetis* (*bellargus*), the only natural hybrid butterflies that we have yet recognisably examined, and brought about by a pairing between a late *coridon* and early *thetis* (*bellargus*) of the late brood, the larvæ taking on the forward habit of *thetis* (*bellargus*), and appearing with the first brood of this species the following spring.

AGRIADES THETIS, v. Rott. (BELLARGUS, v. Rott.)

SYNONYMY.—Species: **Thetis,** v. Rott., "Naturf.," vi., p. 24 (1775); Göze, "Ent. Beitr.," iii., pt. 2, p. 60, *in part* (references to von Rott.) (1780); Schneid., "Sys. Besch.," p. 245 (1787); Bkh., "Sys. Besch.," i., pp. 162, 279 (1788); ii., p. 228, figs. 6-8 (1789); Scriba, "Journal," p. 221 (1791); Kirby, "Syn. Cat.," p. 367 (1871); Scudd., "Hist. Sketch," p. 105 (1875); Buckell, "Ent. Rec.," iv., p. 138 (1893); Kirby, "Handbook," ii., p. 93, pl. xlvi., figs. 1-3 (1896). **Bellargus,** v. Rott., "Naturf.," vi., p. 25 (1775); Esper, "Schmett. Eur.," pl. xxxii. (supp. viii.), fig. 3, p. 333 (1777); pl. lv. (cont. v.), figs. 2, 3, 4, 6 (1778); Bergstr., "Nom.," iii., p. 10, pl. liii., figs. 5-6 (1779); Goeze, "Ent. Beit.," iii.,pt. 2, p. 61 (1780); Schneid., "Sys. Besch.," p. 239 (1787); Bkh., "Sys. Besch.," i., pp. 157, 277 (1788); ii., p. 226 (1789); De Vill., "Car. Linn. Ent. Fn. Suec.," ii., p. 74 (1789); Schwarz, "Raup. Kal.," ii., p. 347 (1791); Panzer, "Schäff. Icon. Ins.," p. 216 (1804); Meig., "Eur. Schmett.," ii., p. 21, pl. xlvii., figs. 3*a-b* (1830); Hein., "Schmett. Deutsch.," i., p. 79 (1859); Staud., "Cat.," 2nd ed., p. 12 (1871); Curò, "Bull. Soc. Ent. Ital.," vi., p. 112 (1874); Kirby, "Eur. Butts.," i., p. 48, pl. xiv., fig. 7 (1882); Lang, "Butts. Eur.," p. 120, pl. xxvi., fig. 4 (1884); Kane, "Eur. Butts.," p. 44 (1885); Auriv., "Nord. Fjär.," p. 14 (1888-91); Buckell, "Ent. Rec.," iv., p. 138 (1893); Rühl, "Gross-Schmett.," p. 275 (1892-1895); Meyr., "Handbook," etc., p. 348 (1895); Tutt, "Ent. Rec.," vii., pp. 220, 300 (1895); "Brit. Butts.," p. 170, pl. iii., figs. 1-2

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* One suspects the form *calydonius*, Lowe (*Wheeler's Butts. Switz.*, p. 31) taken at Montana, mid-June, 1899, as possibly belonging here. Also, since the above has been in type, Wheeler reports (*in litt.*) the capture of three similar examples at Assisi in Italy, June 28th-30th, 1909, and two others July 19th and 24th also at Assisi, the first three flying with *thetis*, the last two with *coridon*, the former being over at the latter date. We are also inclined to suspect the greenish-blue Dover specimen, noted by South (*Ent.*, xx., pp. 80-81) under *bellargus* (no. 9) as also belonging here.

(1896); "Ent. Rec.," vii., pp. 220, 300 (1896); Grote, "Schmett. Hildesh.," p. 42 (1897); Reuter, "Ent. Rec.," x., p. 97 (1898); Staud., "Cat.," 3rd ed., p. 86 (1901); Lamb., "Pap. Belg.," p. 235 (1902); Wheeler, "Butts. Switz.," p. 32 (1903); Tutt, "Ent. Rec.," xviii., pp. 131, 132 (1906); South, "Brit. Butts.," p. 170, pl. cx., figs. 1-11 (1906); Tutt, "Ent. Rec.," xxi., p. 108 (1909). **Adonis,** Schiff., "Schmett. Wien.," 1st ed., p. 184 (1775); Harris, "Eng. Lep.," p. 2 (1775); Göze, "Ent. Beitr.," iii., pt. 2, p. 73 (1780); Fab., "Mant. Ins.," ii., p. 75 (1787); Lang, "Verz.," li., pp. 52, 53 (1789); Rossi, "Fn. Etrusc.," ii., p. 156 (1790); Fab., "Ent. Syst.," iii., pt. 1, p. 299 (1793); Bkh., "Rhein. Mag.," i., p. 286 (1793); Lewin, "Ins. Gt. Brit.," p. 80, pl. xxxviii., figs. 1-3 (1795); Hübn., "Eur. Schmett.," pl. lxi., figs. 298-300 (1796); pl. cxxvii., figs. 645-6 (*ante* 1816); pl. cxxxviii., figs. 698-9 (*ante* 1816); Ill., "Schmett. Wien.," 2nd ed., p. 270 (1801); Schrank, "Faun. Boica," ii., pt. 1, p. 213 (1801); Haw., "Lep. Brit.," p. 44 (1803); Hofmnsgg., "Ill. Mag.," iii., p. 184 (1803); Herbst, "Nat. Sys. Ins.," xi., p. 201, pl. 312, figs. 7, 8, 9 (1804); Latr., "Hist. Nat. Crust.," xiv., p. 118 (1805); Hübn., "Eur. Schmett.," text p. 49 (*circ.* 1805); Ochs., "Schmett. Sachs.," p. 323 (1805); Fab., "Ill. Mag.," vi., p. 286 (1807); Ill., "Rossi's Fn. Etrusc.," ii., p. 247 (1807); Ochs., "Die Schmett.," i., pt. 2, p. 33 (1808); Oken, "Lehrb.," ii., p. 719 (1815); Leach, "Edin. Ency.," ix., pt. 1, p. 129 (1815); Dalm., "Handl.," p. 97 (1816); Ochs., "Die Schmett.," iv., p. 25 (1816); Hübn., "Verz.," p. 68 (1816-8); Godt., "Enc. Méth.," p. 691 (1819); Sam., "Ent. Comp.," p. 26 (1819); Godt., "Pap. Fr.," i., p. 210, pl. xi. *tert.*, fig. 2, pl. xi. *sec.*, fig. 2 (1821); Curt., "Brit. Ent.," v., fo. 6 (1824); Stphs., "Illus. Haust.," i., p. 89 (1828); "Ins. Cat.," 1st ed., i., p. 23 (1829); Bdv., "Eur. Lep. Ind.," p. 12 (1829); "Icones Chen.," pl. ii., figs. 4-5 (1832); Dup., "Pap. Fr.," supp. i., p. 389 (1832); Treits., "Die Schmett.," supp. x., p. 68 (1834); Stphs., "Illus. Haust.," iv., app. p. 404 (1834); Vill. and Guen., "Tab. Syn. Lep. Eur.," p. 20 (1836); Ramb., "Faun. And.," p. 272 (1839); Wood, "Ind. Ent.," p. 8, pl. ii., fig. 66 (1839); Bdv., "Gen. et Ind. Meth.," p. 12 (1840); Westd., "Syn. Gen.," ii., p. 88 (1840); Humph. and Westd., "Brit. Butts.," p. 106, pl. xxxiii., figs. 1-3 (1841); Neust. and Korn., "Schmett. Schles.," p. 47, pl. xxii., figs. 71*a-c*, (1842); Hch.-Schäff., "Sys. Bearb.," i., p. 121, pl. lii., fig. 248 (1843); Dup., "Cat. Méth.," p. 33 (1844); Heydrch., "Lep. Eur. Cat. Meth.," i., p. 14 (1851); Stphs., "List," 1st ed., p. 19 (1850); Meyer-Dür, "Schmett.-Schweiz," p. 82 (1851); West. and Hew., "Gen. Diurn. Lep.," ii., p. 493 (1852); Freyer, "Neu. Beit.," vi., p. 13, pl. 487, figs. 1-2 (1852); Led., "Verh. zool.-bot. Gesell.," p. 20 (1852); Gerh., "Mon.," p. 17, pl. xxx., figs. 1*a-c* (1853); Wallgrn., "Skand. Dagf.," p. 223 (1853); Stphs., "List," 2nd ed., p. 18 (1856); Sta., "Man.," i., p. 60 (1857); Ramb., "Cat. Lép. And.," p. 41 (1858); Speyer, "Geog. Verb. Schmett.," i., p. 85 (1858); Dbldy., "Syn. List," 2nd ed., p. 2 (1859); Staud., "Cat.," 1st ed., p. 5 (1861); Kirby, "Man.," i., p. 107 (1862); Röss., "Schmett. Nass.," p. 116 (1866); Berce, "Faun. France," p. 142 (1867); Nolck., "Lep. Fn. Estl.," i., p. 57 (1868); Butl., "Cat. Diurn. Lep.," p. 170 (1869); Mill., "Cat. Lép. Alp.-Mar.," p. 103 (1871): Newm., "Brit. Butts.," p. 129, fig. 43 (1872); Cunì-y-Mart., "Lep. Barc.," p. 20 (1874); Frey, "Lep. Schweiz," p. 19 (1880); Lampa, "Ent. Tids.," vi., p. 14 (1885); Buckl., "Larvæ," etc., i., p. 106, pl. xv., fig. 1 (1886); Dale, "Hist. Brit. Butts.," p. 66 (1890); Barr., "Lep. Brit. Isl.," i., p. 81, pl. xiii., figs. 1-1*f* (1893). **Salacia,** Bergst., "Icon. Pap. Diurn.," dec. i., pl. v., figs. 1-2 (1779); "Nom.," iii., p. 4, pl. l., figs. 1-2 (1779). **Tiphys,** Esp., "Schmett. Eur.," pl. li. (contd. i.), fig. 4 (1778). **Venilia,** Bergst., "Icon. Pap. Diurn.," dec. i., pl. v., figs. 3-4 (1779); "Nom.," iii., p. 5, pl. l., figs. 3-4 (1779). **Hyacinthus,** Lewin, "Ins. Gt. Brit.," p. 80, pl. xxxvii., figs. 4-6 (1795); Haw., "Lep. Brit.," p. 45 (1803). **Argus,** Don., "Brit. Ins.," iv., p. 93 (1795). **Urania,** Gerh., "Mon.," p. 17, pl. xxx., fig. 4 (1853).

Original description.—*Papilio Plebeius Ruralis thetis.*—This butterfly is one of the most charming of the Argus butterflies. The male* is a beautiful blue above, although there is a blackish shade on the costa of the forewings, which, in some specimens, though only a few, takes up the larger portion of the forewings, sometimes even also a part of the hindwings, but these are not so beautiful as the others, in which a splendid bright blue covers all the four wings, and the black shade only borders the costa of the forewings as a broad streak. Besides this the hindwings are bordered with a row of beautiful cinnabar-red lunular spots, below each of which lies a black dot; this border is continued on the forewings, although indistinctly, and the black dots are absent. The outer border (fringe) is white with blackish spots. The female is quite dark brown above in some, and only scaled slightly with blue. The wings are, as in the male, bordered with lunular spots, but they are here not such a beautiful cinnabar-red as in the male, but only orange-yellow. These run in some specimens round all the wings, in others only round the hindwings, in some these orange spots on the hindwings have a beautiful bright blue border to their upper edges. On the underside both sexes have similar markings, only the ground colour is in the female somewhat darker. Altogether this butterfly appears beneath very similar to *P. coridon*, which I have already mentioned above. If one, therefore, observes the figure which Kleemann, in his *Beiträge*, taf. 14, fig. 4, has given of the underside of that butterfly, one will easily be able to imagine the markings on the underside of the butterfly now described, except that, in this, the ground colour is not so light a grey, but more brownish-grey. This butterfly is rather rare in this district. It appears only in gardens, and in the month of August (von Rottemburg, *Naturf.*, vi., no. 11, p. 24). This is followed by *Papilio Plebeius Ruralis bellargus*. On the upperside, this butterfly exhibits the brightest and most beautiful blue of all the Argus butterflies. The blue colour occupies the whole of the four wings, and is of such a dazzling blue, and such a beautiful lustre, that it is impossible to do it full justice in a painting. The fringe of all four wings is white, marked with blackish spots, as in the last species (*Papilio thetis*). On the underside this butterfly resembles *P. coridon*, and, therefore, need not be described. The butterfly is very scarce in this neighbourhood (Landsberg-on-the-Warte). It appears in gardens at the beginning of June. I do not know whether the other sex may not be brown on the upperside as in the other species of Argus, but I am inclined to suppose so (von Rottemburg, *Naturf.*, vi., no. 12, p. 25).

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* There can be no doubt whatever that the so-called ♂ of von Rottemburg's *thetis* was the strongly blue-tinted ♀, the ♀ of *thetis* the brown ♀, and *bellargus* ♂, the ♂ of the same species.

Imago.—28mm.-38mm.—♂. All the wings of a most brilliant glossy blue; the ♀ brown, often shaded with blue, with orange crescents surrounding a series of marginal black spots; the fringes of both sexes white, ticked with black. Underside ♂ forewings dark grey, with a central discoidal spot, a submedian transverse row of seven spots, and two basal spots, all black, edged with white; the hindwings dark grey-brown, the base strongly scaled with metallic-green or -blue, a curved submedian row of nine black spots, three or four basal spots, all edged with white, a linear discoidal spot often entirely white; all the wings with a row of marginal ocellations, edged with orange lunules.

Sexual dimorphism.—The sexual colour difference is most marked, the ♂s, as already noted, of a most brilliant blue; the ♀s brown, more or less scaled with blue, and with marginal orange crescents; the most extreme forms of the ♀ are almost as blue as the ♂s, but show the orange lunules characteristic of the ♀ on the upper margin.

On the underside the ♂ is of a distinctly paler ground colour than the ♀. The hair-scales are numerous in the ♂ of this species. Pierce notes the scales of this species as follows:—*Male:* (1) The androconia are oval in outline, 0·001in. long, 0·0005in. wide; there are eight rows of twelve spots more or less coalesced into a line, crossing each scale. At the base of the wing the androconia are much larger, sometimes twice, when the measurements would be 0·002in. (=0·05mm.) and 0·001in. (=0·025mm.). [This latter is practically the measurement given by Aurivillius (*Bih. Svensk. Vet. Akad. Handl.*, v., p. 24), *viz.*, 0·054mm. long without the stem, 0·06mm. with it, and 0·025mm.-0·027mm. wide.] (2) The transparent scales are rounded at the apex, 0·003in. × 0·0015in., deep bronze-yellow in colour, deepest at the apex, and beautifully shaded to the base. (3) Dark scales similar, but with four lobes. (4) The covering scales 0·018in. × ·002in., with seven very fine striæ. (5) The underside scales are of many varieties, but are generally three-pointed, and of various lengths. *Female:* (1) With the same bronzy-yellow, shaded scales, but generally with two or three lobes. (2) The darker scales more acutely pointed than in ♂. (3) Underside scales with two and three points, similar to those of ♂.

Gynandromorphs.—Several gynandromorphs of this species have been recorded. The following are those of which we have notes:—

α.—Of ordinary size. Left side ♂, right side ♀; on the body a tolerably distinct division, the right side ventrally scaled with brown, the left with white; the left side dorsally with blue, the right with scarcely a blue hair visible. The antenna on the right side shorter than on the left. The ♀ wings, on the right side, brown, with reddish-yellow marginal spots, the forewing with a dark central spot; the ♂ wings, on the left side, beautifully blue, with a narrow black border. The fringes of all the wings similar. The right (♀) forewing seven lines long, the left (♂) forewing seven-and-half lines long. The underside of the wings differs little on the two sides. In the Berlin Mus. (Klug, *Jahrbücher*, 1834, p. 256).

β.—Regularly halved. Left side ♂, right side ♀. Upperside and underside typical in colour and markings. Found at Interlaken, Switzerland. Coll. Wiskott (Wiskott, *Lep. Zwitter*, p. 13, pl. iii., no. 17).

γ.—Right side ♂, left side ♀. Taken at Ventnor in August, 1893 (Shipp, *Ent. Record*, v., p. 98).

δ.—Right wings ♂, left wings ♀. Captured June 9th, 1900, near Reigate (Goss, *Ent. Mo. Mag.*, xxxvi., p. 208; *Ent. Rec.*, xiii., p. 218).

ε.—Right side ♂, left side ♀. Captured June 30th, 1889, by K. Jámbary near Budapest (Aigner-Abafi, *Illus. Zeits. für Ent.*, v., p. 331).

ζ.—Imperfect gynandromorph. In shape and colour ♀, on all the wings glittering blue ♂ streaks and spots irregularly placed. Found near Amasia. Coll. Wiskott (Wiskott, *Lep. Zwitter*, p. 13).

η.—Imperfect gynandromorph. In shape and colour ♀. On the two right wings shining blue ♂ stripes. Captured near Amasia. Coll. Wiskott (Wiskott, *Lep. Zwitter*, p. 13).

θ.—A so-called mixed gynandromorph, mainly ♀. On the upperside all the wings asymmetrically streaked with blue to the outer margin, and irregularly covered with scattered blue scales. The underside typical ♀. Abdomen ♀. Eggs apparently partly deposited. Regensburg (Schultz, *Ent. Zeits. Guben*, xx., pp. 156-157).

ι.—Left side ♀ (of the ab. *ceronus*), right side forewing that of a perfectly-formed ♂, nevertheless an equally (well-formed) ♀ hindwing, but with strong blue scaling. Oberweiden, Lower Austria, June 4th, 1899 (Habich, *Verh. Gesell. Wien*, lii., p. 142).

κ.—A ♀ in general characters, the wings on the left side, especially the hindwings, splashed and streaked with ♂ coloration. From South Devon, 1908 (Gibbs, *Proc. Ent. Soc. Lond.*, 1908, p. lxii).

λ.—A partial gynandromorph, chiefly ♀, but two-thirds of the hindwings of typical ♂ coloration and markings (Hodgson, *Proc. Ent. Soc. Lond.*, 1908, p. lxxviii).

μ.—Partial gynandromorph. ♀ partly covered with blue like ♂, the upperside dashed with bright blue, not shading off into the brown, but clearly and sharply defined. Exhibited meeting Ent. Soc. of London, December 7th, 1868 (Bond, *Proc. Ent. Soc. Lond.*, 1868, p. xlii).

ν.—Partial gynandromorph. Dark brown, shot with blue. Apparently a ♂. Captured at Dover by Chatwin, 1880. Briggs' coll. (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77).

ξ.—The left forewing conspicuously ♂, the left hindwing slightly splashed with ♂ colouring. The right side ♀. Captured at Dover by Bayley, in 1879. Briggs' coll. (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77).

ο.—The right forewing and the apical corner of the right hindwing ♂, the rest of the right hindwing and the two left wings ♀. Captured May 15th, 1908, at Dompierre-sur-Mer, Charente-Inférieure (Oberthür, *Lép. Comp.*, 3rd fasc., p. 407, pl. xix., fig. 69).

π.—The two right wings ♂, of the *puncta* form, the left wings ♀ of the *lunulata* form. The left wings distinctly larger than the right. Captured May 27th, 1907, at Digne (Oberthür, *Lép. Comp.*, 3rd fasc., p. 407, pl. xix., fig. 70).

Schultz notes (*Woch. für Ent.*, ii., p. 365) two probable gynandromorphs in the "Staudinger coll." Dadd has been good enough to obtain for us descriptions of these specimens from Bang-Haas, which read as follows:—

ρ.—Brown ♀, in which the right forewing, with the exception of the costal margin, is entirely blue. Both sides with the same measurements. Locality unknown (Bang-Haas *in litt.*).

ς.—Left side smaller and more dusted with blue than the right. Locality unknown (Bang-Haas *in litt.*).

The following appear to suggest gynandromorphic tendencies:—

τ.—♂. The brilliant blue colour entirely suffused with black scales. Folkestone, 1891 (Austin, *Proc. Sth. Lond. Ent. Soc.*, 1892, p. 23).

υ.—Mixed. ♀ left forewing and two hindwings brown, with faint orange lunules on left forewing, well-marked ones on both hindwings; right forewing slightly larger than left, with blue inner margin from base to anal angle, and also blue apex extending almost to discoidal, perhaps an irregularly-marked ♀ only. Tutt. coll.

φ., etc.—Several ♂s with one or all of the wings thickly irrorated with black scales (Webb, *Ent.*, xxi., p. 133).

Teratological examples.—The following are some notes concerning teratological examples that have come under our notice:—

α.—♂. The forewings normal, the right hindwing also normal (14mm. × 10mm.), the left hindwing dwarfed (12mm. × 7mm.). Captured at Digne, August 19th, 1906. Tutt coll.

β.—♂. The right forewing has only half the normal width; the other three wings normal. All the nervures appear to be present, but extremely close to one another. The underside has a large cellular spot, and three small submedian unocellated spots. Captured at Veyrier, May 31st, 1908. Blachier coll.

γ.—♀. The right hindwing has a round hole in the neighbourhood of the anal angle. Captured at Martigny, May 21st, 1905. Blachier coll.

δ.—♂. The left forewing with the apical area truncate, the termen excised below the apex; the left hindwing with the termen excised between veins 6 and 2. Captured at Folkestone by South (South, *Proc. Sth. Lond. Ent. Soc.*, 1892, p. 58; Hampson, *Ent. Mo. Mag.*, xxxvii., p. 120).

ε.—♂. The left hindwing about two-thirds the natural size, very narrow, and rather short. Captured at Folkestone by South (South, *Proc. Sth. Lond. Ent. Soc.*, 1892, p. 58; Hampson, *Ent. Mo. Mag.*, xxxvii., p. 120).

ζ.—♂. The left hindwing with straight, instead of curved, outer margin, making this wing narrower. Right pair of wings normal. Captured at Cuxton, May 20th, 1893. Tutt coll.

η.—♂. The left forewing hollowed considerably on the outer margin just above the anal angle; the left hindwing considerably hollowed on the inner margin; fringes of both hollows perfect. Right pair of wings normal. Captured at Cuxton, June, 1881. Tutt coll.

θ.—♂. The right forewing rounded at the apex, from which, on the costa, a narrow portion of the wing appears to be excised, the edge of this portion, however, with a well-developed white marginal fringe. The other wings normal. Captured at Cuxton, May 20th, 1893. Tutt coll.

ι.—♂. The left fore- and the left hindwing both curved inwardly in the middle of the outer margin, giving a distinct concave margin to this part of the wings Right pair of wings normal. Captured at Cuxton, May, 1881. Tutt coll.

κ.—♂. The right hindwing with the outer margin cut off sharp and straight, so as to distinctly narrow the wing. [Like ζ, but the right hindwing instead of the left hindwing modified.] Captured at Cuxton, September 10th, 1891. Tutt coll.

λ.—♂. The right forewing curved inwards on the middle of the outer margin, giving a concave edge; the left hindwing rather smaller than the right hindwing. [The specimen of the form *minor*.] Captured at Cuxton, August 22nd, 1893. Tutt coll.

μ.—♂. The right forewing contracted medially, making the wing decidedly narrower, and the costa rather rounder. Captured at Cuxton, June 6th, 1884. Tutt coll.

ν.—The right forewing slightly concave below apex, the apex itself in consequence distinctly acute; the right hindwing with the middle of the outer margin slightly concave. The markings seem in no wise affected (South, *Proc. Sth. Lond. Ent. Soc.*, 1892, pp. 58-59).

ξ.—An autumnal example with the forewings shaped like those of *Gonepteryx rhamni* (Webb, "Entom.," xx., p. 132).

It may be well to notice here a remark by Tunaley (*Ent. Rec.*, vii., p. 192) on the tendency to angularity in the hindwings of this species at Freshwater, in August and September, 1895.

Pathological examples.—We have only descriptions of the following specimens, although many probably exist—

α.—♀ with the left hindwing pallid, shiny, and wanting in pigment, especially on the outer half of the wing, the left forewing similar on the outer margin more broadly so in the area of the anal angle. Cuxton, May 20th, 1893. Tutt coll. (*Trans. Ent. Soc. Lond.*, 1894, pp. xv.-xvi).

β.—♀ in which large patches of the wing are entirely destitute of scales, and showing the underside markings through. Captured at Folkestone by Weston. Briggs' coll. (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77).

γ.—♀ with forewings uniformly pallid, greyish; the hindwings normal. Cuxton, September 3rd, 1887. Tutt coll.

δ.—♂. Grey, with a brownish shade and a very faint tinge of blue. Ocelli on hind margins of hindwings faintly indicated. Underside normal. Kent, June, 1886 (South, *Ent.*, xx., p. 80).

ε.—♂. Central area of all wings mauve, with *bellargus*-blue margins; nervures black on hind margins of forewings; black spots on margin of hindwings; fringes faintly chequered on forewings, but plain white on hind pair. Underside normal. Kent, June, 1886 (South, *Ent.*, xx., p. 80).

ζ.—♂. One-third of the wings nearest the base of the natural colour, then shading off into sooty-black. Folkestone, 1887 (Webb, *Ent.* xxi., p. 133).

η—♂. With the hind margins of all wings shading off into dusky white. Folkestone, 1887 (Webb, *Ent.*, xxi., p. 133).

θ.—♂ with the marginal orange lunules of the lower side indistinctly visible from above also. Folkestone, 1887 (Webb, *Ent.*, xxi., p. 133). [This suggests a failure in the structure of the membrane and scaling of the hindwings, as the orange lunules show through.]

ι—μ.—Four ♂s of a very abnormal colouring, pure French grey in hue (the wings almost appear to have been powdered over with slate pencil dust). It is probable that want of power has something to do with this, as three of the specimens show wings torn in escaping from the chrysalis (Webb, *Ent.*, xxi., p. 133).

ν.—♀. Pale brown, with a faint tinge of blue and indistinct ocelli on the hind margins of all the wings. Underside similar to that of *bellargus*, but the black spots very small. Kent, September, 1886 (South, *Ent.*, xx., p. 80).

ξ.—♀. Pale brown, shot with pale blue at the bases of all the wings; a band-like series of orange crescents on hind margins; fringes white, with only faint traces of chequers. Underside very like some examples of *Polyommatus icarus* with clear white discoidal spot on hindwings. Kent, June, 1886 (South, *Ent.*, xx., p. 80).

o.—♀. Ground colour of a pale uniform washed-out khaki-yellow on both sides, with faint marginal lunules round all the wings. Vienne=*albinismo-rufescens*, Obth., *Lép. Comp.*, fasc. 3, p. 407, pl. xix., fig. 63 (1909).

Webb notes *Ent.*, xxi., p. 134) that an occasional form of aberration of almost annual occurrence, appears to be a defect in the mature scaling of the wings, which causes the insects affected to look shining, almost as though they had been dipped in oil.

Variation.—The variation of this species is considerable, although purely racial forms are much less frequent than in the allied *Agriades coridon*. The different shades of the ground colour of the ♂s, usually of the most brilliant hue, are most difficult to differentiate in words. One distinguishes in any ordinarily long series captured in Britain, at least four distinct shades:—

1. Brilliant shiny, silky, or pearly-blue=*excelsia*, n. ab.
2. Brilliant shining sky-blue=*adonis*, Schiff.
3. Brilliant shiny blue, with a slight tinge of purple (or violet)=*bellargus*, v. Rott.
4. Brilliant shiny blue, strongly tinged with purple (or violet)=*purpurascens*, n. ab.

Besides these, there are several other described forms, *e.g.*, (1) silvery-grey=ab. *argentea*, Obth.; (2) pale lavender or pale lilac=ab. *pallida*, Aust.; (3) bluish-grey=ab. *czekelii*, Aign.-Abafi; (4) leaden-blue =ab. *nigra*, Ckll. There is some ground for believing that the two last-named may also be produced artificially. Pickett (*Proc. South Lond. Ent. Soc.*, 1906, p. 47), Hodgson (*op. cit.*, 1908, p. 46), and others, speak of a greenish-blue form (=ab. *viridescens*, n. ab.), and Prideaux observes (*in litt.*) that specimens taken at Seaton, September 1891, showed, on the average, a decidedly greener shade of blue than specimens from Surrey or the Isle of Wight. There is occasionally some suggestion of racial tendency in developing a particular form of ground colour locally, *e.g.*, the Mauretanian examples are distinctly purple-blue; the Canales examples, violet-blue (Chapman); the ♂s from Charente-Inférieure, bright sky-blue, like that of *Polyommatus hylas* (Blachier), and so on. There are some very purple-blue specimens in the British Museum coll., from Bergün, Zürich, etc. The nervures in the ♂s are usually pearly-white towards the base, frequently becoming black towards the outer margin, so that the dark dashes in the fringes appear to be continuations of the nervures; the dark dashes, however, are sometimes much less strongly developed on the hindwings than on the forewings, and are reported as occasionally absent altogether, but, judging from the great number of specimens examined without finding a single example, this extreme form (ab. *hyacinthus*, Lewin) must be rare; Blachier notes (*in litt.*) that ♂s in his collection from Charente-Inférieure and Veyrier (near Geneva), have the fringes almost pure white, scarcely chequered with black, only an extremely fine line passes through the fringes as a prolongation of each nervure. In some examples, a trace of a series of interneural marginal spots is found on the hindwings of the ♂s, sometimes developed into a well-defined row of small, roundish, black dots (=ab. *puncta*, Tutt). This character is often strikingly developed in the large Mauretanian race, *punctifera*, Obth., although the latter is not merely characterised by this, for, it has, in addition, distinct traces of interneural antemarginal dots united to the marginal border of the forewings, giving the border quite a widened appearance, whilst the ♀ of this race is also very specialised. In some ♂ s a series of fine, narrow, white streaks is found immediately inside the slender, black, marginal line, and parallel with the margin of the wing; the streaks are usually equidistant from one another, and occupy only the middle of the interneural space, but sometimes they are elongated, and almost touch (= ab. *albolineata*); very rarely they extend from the anal angle (when the first streak is placed under the double black dot when it exists) to the anterior margin, or as far as the black costal portion of the hindwing; more often, they are found only in the posterior interneural spaces, and, when any are wanting, it is always the front ones, so that when the posterior spaces are without them, there are none at all. Reverdin notes (*in litt.*) that he finds in his collection—13 ♂ s with the streaks, out of 15 without the antemarginal series of black dots; 28 with the streaks out of 30 which have the black dots only slightly marked; 10 out of 10 in which the black dots are well-marked—the specimens belonging to both broods. Blachier observes (*in litt.*) that these white interneural streaks are specially noticeable in some ♂ s from Charente-Inférieure, in which the effect is very curious. The ♀ s of this species are very variable, and the variations difficult to group, although most fall under certain definite types characterised by the ground colour, the quantity of blue scales, and orange lunular markings. The ground colour is sometimes distinctly brownish (more often in the late than in the early brood, though occurring in both) (=ab. *brunnescens*), more generally blackish-fuscous (=ab. *nigrescens*), particularly in the first brood, though sometimes the prevailing form in the second. The blue scaling may be altogether wanting, or may be spread over the whole wing area; it also shows two very distinct tints—the brilliant sky-blue of *adonis*, and the bright purple-blue of *purpurascens*, the latter, in British examples, much more frequent; the extreme forms of those with the brilliant *adonis*-blue have a very distinct metallic sheen (=ab. *metallica*, n. ab.). The orange lunules, which, similarly, may be confined to a small area on the hindwing, or developed into a well-developed band on all the wings, vary from a pale yellow (*flavescens*), through bright orange (*aurescens*), to red (*rufescens*). Hodgson notes (*Proc. Sth. Lond. Ent. Soc.*, 1908, p. 46) that, in British examples, "the tone varies from deep red or brown to pale yellow or primrose-white"; on the whole, however, the British specimens are among those with the reddest spots, the Dalmatian examples the fullest orange, but the latter, so far as our observation goes, show no trace of blue. The following is a rough attempt to tabulate the forms, not distinguishing, however, between those of decided brown (*brunnescens*) and blackish (*nigrescens*) ground colour—

1.—With orange lunules on hindwings only=ab. *posticolunulata*, n. ab.

2.—With orange lunules on hindwings, and faintly also on forewings=ab. *lunulata*, n. ab.

3.—With orange lunules well developed on all wings=ab. *marginata*, Tutt.

1*a*.—As in 1, but with blue scaling at base of forewings, on inner margin of hindwings, and edging orange lunules externally=ab. *venilia*, Bergstr. (=*thetis* ♀, v. Rott., *in part*).

2*a*.—As in 2, but with blue scaling at base of forewings, on inner margin of hindwings, and edging orange lunules externally=ab. *venilia-lunulata*, n. ab. (= *thetis* ♀, v. Rott., *in part*).

3*a*.—As in 3, but with blue scaling at base of forewings, on inner margin of hindwings, and edging orange lunules externally = ab. *salacia*, Bergstr.

1*b*.—As in 1*a*, but with blue lunules or cuneæ, edging orange internally = ab. *caeruleo-cuneata*, n. ab. (= *thetis* ♀, v. Rott., *in part*).

2*b*.—As in 2*a*, but with blue lunules or cuneæ, edging orange internally = ab. *cuneo-lunulata*, n. ab.

3*b*.—As in 3*a*, but with blue lunules or cuneæ, edging orange internally = ab. *cuneo-marginata*, n. ab.

1*c*.—As in 1, but with blue scaling of forewings extending beyond discoidal, of hindwings over inner margin and centre of wing to orange lunules = ab. *caerulescens*, n. ab.

2*c*.—As in 2, but with blue scaling of forewings extending beyond discoidal, of hindwings over inner margin and centre of wing to orange lunules = ab. *caerulescens-lunulata*, n. ab.

3*c*.—As in 3, but with blue scaling of forewings extending beyond discoidal, of hindwings over inner margin and centre of wing to orange lunules = ab. *caerulescens-marginata*, n. ab.

1*d*.—As in 1, but with blue scaling of all wings extending to marginal band, the nervures, costa, and outer margin only dark = ab. *semiceronus*, n. ab. (= *thetis* ♂, v. Rott., *in part*).

2*d*.—As in 2, but with blue scaling of all wings extending to marginal band, the nervures, costa, and outer margin only dark = ab. *ceronus-lunulata*, n. ab. (= *thetis* ♂, v. Rott., *in part*).

3*d*.—As in 3, but with blue scaling of all wings extending to marginal band, the nervures, costa, and outer margin only dark = ab. *ceronus*, Esp. (= *thetis* ♂, v. Rott., *in part*).

1*e*.—As in 1, but with blue scaling extending over all wings to outer margin; costa and nervures also blue = ab. *semicoelestis*, n. ab.

2*e*.—As in 2, but with blue scaling extending over all wings to outer margin; costa and nervures also blue = ab. *subcoelestis*, n. ab.

3*e*.—As in 3, but with blue scaling extending over all wings to outer margin; costa and nervures also blue = *coelestis*, Obth.

This is an awkward grouping, but it is difficult to combine a number of different features in one insect in a succinct and simple manner. There is, further, considerable variation in the development of the discoidal lunules. The British examples do not show a discoidal lunule on the hindwings. Reverdin makes (*in litt.*) a similar observation concerning the Swiss specimens; on the other hand, there are many examples in the British Museum coll., from various localities that do so; there are two very pretty aberrations connected with the discoidals, one in which they are cinctured with a white ring = ab. *albicincta*, n. ab., the other with them surrounded with blue = ab. *caeruleocincta*, n. ab. Occasionally, an entirely blue spot replaces the discoidal on the hindwings (*caeruleopuncta*, n. ab.). Of the racial ♀ forms, it is to be noted that the bluest ♀ *punctifera*, Obth., are almost identical with the earliest figure of *ceronus*, Esp., whilst *alfacarensis*, Ribbe, is merely a well-defined form of *marginata*, Tutt. The *thetis* of von Rottemburg, puzzled all the older lepidopterists since he described the bluer ♀ s with well-defined orange lunules on the hindwings, and ill-defined lunules on the forewings, as ♂ *thetis*, including also those ♀ s in which the blue was more restricted (see *anteà* p. 326), and the ♀ s entirely, or almost entirely, without blue scales, he described as ♀ *thetis*, whilst he then describes the real ♂ as *bellargus*. Esper was also much muddled over *thetis*, v. Rott., and figured (*Schmett. Eur.*, i., pl. xxxii., fig. 2) one of the blue ♀ forms of *Polyommatus icarus* under this name. This figure was copied by Bergsträsser (*Nom.*, iii., pl. liii., figs. 3-4), who, however, whilst referring it to *thetis*, Esp., renamed it *oceanus*; later, however, by reference (*op. cit.*, p. 35), he named his pl. lv., figs. 5-6, representing a quite different form of *Polyommatus icarus*, *thetys*.

The slightest attention, however, to von Rottemburg's original description of *thetis*, should have saved both authors from so palpable a blunder. Bergsträsser then further asserts (*op. cit.*, iii., p. 35) that his *thetys* (pl. lv., figs. 5-6), *salacia* (pl. l., figs. 1-2), *pampholyge* (pl. xlvii., figs. 1-2), *venilia* (pl. l., figs. 3-4), and *oceanus* (pl. liii., figs. 3-4) were united by von Rottemburg under the name of *thetis*, but this is not so, for, although *salacia* and *venilia* are two ♀ forms of the insect we are considering, *thetys*, *pampholyge*, and *oceanus* are merely different ♀ forms of *P. icarus*, and quite excluded by their fringes from von Rottemburg's description of *thetis*, as already noted. Borkhausen described (*Sys. Besch.*, ii., p. 228) his *thetis* from Landsberg-on-the-Warte, whence came von Rottemburg's examples; his ♂ and ♀ *thetis* were also two ♀ forms of this species, but he enquires very pertinently how *thetis* is to be distinguished from *bellargus*, especially the ♀. In Britain, the ♀ s are particularly variable, both as to ground colour, quantity of blue scaling, number and intensity of the orange-red lunules, etc. Of the Swiss examples, Reverdin notes (*in litt.*): The ground colour is generally brown, with a slight reddish tone, rarely it is almost black; the specimens with blue scales divide up into many groups, *e.g.*, (1) those with only a few blue scales at base of wings; (2) with the base of the forewing and the antemarginal region of the hindwings blue; (3) those that are true *ceronus*, the nearest Swiss examples to which have the blue occupying the whole of the forewings except the costa and the outer margin, and the whole of the hindwings except a more or less wide band on the front margin; the blue tint is particularly striking on the hindwings, forming blue lunules surmounting the orange lunules; these latter are smaller on the forewings than on the hindwings, and decrease as they near the apex of the wing, the front lunules being also less defined than the hind ones, and sometimes only indicated by narrow, indistinct, whitish streaks, parallel to the outer margin; usually these, *i.e.*, with the faintest lunules, are the most blue examples; in the hindwings the lunules, varying from fulvous to almost red, also decrease in size from the apex backward, etc.; the black marginal kernels are semicircularly edged behind with white or blue; in one example the semicircles are invaded by black, which gives it a striking appearance, whilst, in another, the black terminal line, instead of running regularly on, breaks into the blue semicircles to the neural area, and so diminishes the extent of the blue. Blachier notes (*in litt.*) the Geneva examples as brown, with red-, orange-, or apricot-coloured lunules on all the wings, or only on the hindwings, the latter specimens usually strongly scaled with blue; the bases of the wings are usually blue-scaled, but some are entirely brown to the base; the red lunules of the hindwings rest on larger or smaller black spots, whilst between the marginal line and these spots, are small, blue or white, arcs; the red lunules themselves are sometimes surmounted with pale or dark blue crescents. Blachier further mentions an extreme blue ♀ in which there are no fulvous lunules on the forewings, and scarcely any trace thereof on the hindwings. Courvoisier says that the ♀ s on the Simplon are often strikingly blue; on the other hand, Frey states that the alpine ♀ s are nearly always uniformly brown, or only very slightly suffused with very pale blue, whilst Zeller states (*Stett. Ent. Ztg.*, 1877, p. 292) that the ♀ s found at Bergün are brown in colour, with scarcely any blue scales, a few only being sometimes found at the bases of the wings. Gillmer, discussing some Moravian examples, notes (*Ent. Zeits. Guben*, xix., p. 73), that the black-brown ♀s are often more or less scaled with blue, and the orange antemarginal lunules vary from a complete band across all the wings, to almost entire obliteration on the forewings. Trautmann states (*Int. Ent. Zeit.*, ii., p. 162) that the ♀s vary much in the Jena district, the reddish spots differing in size and brilliancy, in some reduced to nil, in others very strongly developed. Verity observes (*Bull. Ent. Soc. Ital.*, 1904, pp. 138-139) that, at Lucca, some of the ♀s of the later brood are more or less covered with blue. Staudinger says (*Hor. Soc. Ent. Ross.*, xiv., p. 244) that the specimens of this species, taken in Amasia, in May-June 1875, are little different from the German ones, the ♀s seldom tinged strongly with blue, only one being sufficiently blue to refer to ab. *ceronus*; Miss Fountaine adds that the ♀s were quite typical in Amasia and at Brussa, in May, 1893, but Mann says that the ab. *ceronus* also occurs at the latter place; the only ♀, from Brussa, in the British Museum coll., is brown, with slight traces of blue on the hindwings, strongly developed orange-red lunules on the hindwings and weak ones on the forewings (*lunulata*), whilst a ♀ from Amasia shows blue scaling extending to the orange lunules on the forewings, and along the inner margin of the hindwings, with bright blue lunules edging the orange internally on all four wings, the orange being more weakly developed on the fore- than on the hindwings (*cuneolunulata*). A Borjom ♀ is brown, the hindwings with strong, the forewings with weak, orange lunules (*lunulata*). The French ♀s are particularly variable locally; Warburg notes ♀s at Cannes as being very brilliant violet-blue except on costa, and the orange spots of the hindwings very bright; Gurney reports that the ♀s taken at Digne in June, 1907, were particularly blue, but a few we captured there ourselves in August, 1906, had no trace of blue scaling, and were almost without orange on the upperside; at Draguignan, in early May, 1905, most of the ♀s were dark and tinged with blue, although some were brown and without a trace of it. In our experience, the brown examples without blue on the upperside, whether belonging to the early or late broods, appear usually to be more plentifully supplied with orange above, and Hodgson notes (*Proc. Sth. Lond. Ent. Soc.*, 1908, p. 46) that the blue ♀s taken on the North and South Downs, in 1907, had but little orange on the upperside. General statements concerning the seasonal difference between the ♀s, *i.e.*, those of the two broods of this species, should be accepted with caution, but, on the whole, our experience leads us to believe that the ♀s of the early brood are usually more blue-scaled than those of the later brood, but they vary much in different seasons. In 1893, a specially hot and forward summer in Britain, the ♀s at Cuxton, in Kent, were especially dark, and heavily scaled with blue (=ab. *caerulescens*) in June, whilst in August they were particularly brown, with few or no blue scales, but with the orange specially well-developed (= ab. *marginata*), a few only of the June captures being of this form, but, in other years, in this locality, the autumn examples are as dark and as heavily scaled with blue as the spring ones; and this seems especially to be the case if the second-brood is late in its time of appearance. Butler has noted the difference in successive autumn broods at Folkestone, and states that, in the autumn of 1902, the ♀s were much more dusted with blue than was the case in that of 1901. In

1909, when the season was again very late, and *A. thetis* only just emerging towards mid-September at Folkestone, the ♀s were very dark in ground colour, and well scaled with blue. Adkin reports (*Proc. Sth. Lond. Ent. Soc.*, 1906, p. 69) that, in June, 1906, the species was common near Eastbourne, that most of the ♀s showed some blue coloration, without being extreme in this direction. He had compared them with ♀s of the spring brood captured at Folkestone, with which they agreed closely in the amount of blue scaling, but that ♀s from Reigate, and other inland localities on the North Downs, were much more strongly scaled with blue; further, he observed that the spring ♀s appeared to be infinitely more scaled with blue than those of the autumn brood, but, in September, 1908, also near Eastbourne, he noted (*op. cit.*, 1908, p. 93) that the ♀s were more heavily scaled with blue than he had before observed them, either in spring or autumn, and he came to the conclusion that neither locality nor time of emergence accounted for the prevalence of the blue form. Certainly it would seem that the brownest, and least scaled with blue, ♀s are those that occur comparatively early (August) after hot summers in Britain, *e.g.*, 1887, 1893, etc. Similarly, there is no trace of blue in the ♀s of the second-brood taken at Grésy-sur-Aix, Digne, and other localities in southern France in July and early August. Oberthür records the most brilliantly-blue ♀s from western France, from La Vendée to Bordeaux, along the littoral, and not occurring for any distance inland; this form has been named *coelestis*. There is a great amount of variation in the size of the specimens in both sexes, in both broods. The smallest examples (doubling from apex of wing to centre of thorax) in our British collection, measures about 24mm., the largest about 36mm., ♂, 38mm. ♀; the smallest ♂ in our Continental collection reaches 30mm., the largest ♂s 40mm.-42mm.; the smallest ♀ 32mm., the largest ♀s 38mm.-40mm. Reverdin states that the largest ♂ in his collection (out of 65 specimens) measures 33mm. (doubling the length of the wing), the largest ♀ (out of 27 specimens) 34mm.; the smallest ♂ measures 28mm., and the smallest ♀ 30mm. Turner records (*Proc. Sth. Lond. Ent. Soc.*, 1908, p. 64) the capture of two small ♀s at Ranmore, the smaller only 22mm. in expanse. Examples 26mm. and less we call ab. *minor*, those more than 38mm. in expanse, ab. *major*. As will be noted above there is some difference in size racially, *e.g.*, our British race averages much less in size than those of southern France. The localities that give the largest average are Draguignan (May, 1905) and Digne (August, 1905). The general ground colour of the underside of the ♂s varies from whitish- and pale grey, to blackish- or brownish-grey, always a little darker and browner on the hind- than on the forewings; Blachier notes (*in litt.*) that some of the specimens of the spring emergence, have the underside of the hindwings as grey as the forewings, but slightly darker; some ♂s of the autumn emergence (Folkestone, 1909) are quite blackish-grey. The ground colour of the ♀s is more brown-grey than the ♂s, that of the hindwings more fulvous or brownish than the forewings, although in some examples the difference is slight. The undersides of both sexes may be roughly grouped as (1) Whitish-grey, the hindwings tinged with yellowish = ab. *pallescens*, n. ab. (2) Dark grey, the hindwings strongly browned = ab. *fuscescens*, n. ab. (3) Blackish-grey, the hindwings brown-black = ab. *atrescens*, n. ab. The antemarginal chevrons in the ♂ are sometimes red, but occasionally they are merely grey (ab. *initia*), pale ochreous being much more frequently the tint; in both wings, those nearest the anal angle are usually the more brightly coloured, and those on the hindwings brighter than those on the forewings; in the ♀, they are frequently of a quite bright orange-red colour. The base of the hindwings varies from metallic-green to metallic-blue. The spots on the undersides vary considerably in size; some are exceptionally large, as figured by Bergsträsser (*Nom.*, iii., pl. liii., fig. 6) (= ab. *crassipuncta*, Courv.); in others they are exceptionally small, and tend to obsolescence, without, however, being actually absent (= ab. *parvipuncta*, n. ab.). The normal spotting (omitting the marginal series) on the underside of the forewings, consists of seven (occasionally eight) black, white-margined, spots in the submedian series, the two nearest the inner margin in the same interneural space, and often united, and two similar spots between the discoidal lunule and the base; the hindwings have a submedian row of eight spots, and three or four basal spots; very rarely the spots are not black-centred, but only the white rings, suffused inwardly, remain = ab. *albo-ocellata;* still more rarely the black spots have no white margin = ab. *nigro-ocellata.* The variation in the number of spots may be in the direction of increase or decrease. Those examples showing an increase in the number of spots are known as ab. *addenda;* those which show a decrease, as ab. *obsoleta.* The most extreme forms of ab. *addenda* have, sometimes, several small spots between the submedian and the discoidal, and the basal and discoidal, whilst there is often a duplication of the basal spots in the forewing, and an increase of those of the hindwing. The most extreme forms in the direction of obsolescence, have no spots except the discoidal = ab. *obsoleta*, Tutt (= ab. *krodeli*, Gillm.); one of the most common forms of obsolete variation is the absence of one or both of the basal spots on the forewings, and the basal spots of the hindwings may be reduced to two or one, the latter rarely. The discoidal spot on the underside of the forewings is sometimes doubled (*discoidalis-duplex*); on the other hand, Grosvenor observes (*Ent.*, xl., p. 300) a specimen without the discoidal spots (*discoidalis-nulla*). Courvoisier names (*Mitt. Sch. Ent. Gesell.*, xi., p. 22) a number of these slight obsolete variations, *e.g.*, he observes that the normal number of spots at the base of the forewings is two, and calls the examples with three basal spots, ab. *tripuncta*, those with four, ab. *quadripuncta*, whilst (*op. cit.*, p. 24) those with one basal spot are called ab. *unipuncta*, and those with none, ab. *impuncta.* The extension or union of the spots into streaks is a not uncommon form of variation, and, in 1896, we described these various forms under the collective name *striata.* These streaked forms, however, are traceable along two entirely different lines of development, (1) the streaks formed by the union of two or more spots by a connecting bar = ab. *conjuncta*, (2) the streaks formed by the extension of the ordinary spots = ab. *striata*, in its more restricted sense. Some of the individual aberrations of the form *striata*, *sens. lat.*, have been separately named by Courvoisier and others, *e.g.*, Courvoisier describes (*Mitt. Sch. Ent. Gesell.*, xi., p. 20) a form, in which the lower basal spot is united to the lowest spot of the submedian row, as ab. *arcuata;* similarly, he calls the form in which the confluence between these spots is not quite complete ab. *semiarcuata.* To complete this common series, we may note the occurrence of ab. *costajuncta*, in which the first basal and upper submedian spots of hindwings are united, and ab. *basijuncta*, in which the penultimate basal spot of the hindwings is joined to the penultimate spot of the curved submedian row. In his "Formæ confluentes multiplices," Courvoisier notes an example in which the characters of ab. *arcuata*, ab. *costajuncta*, and ab. *basijuncta*, are united, really a somewhat rare form of our ab. *conjuncta*. Under the name ab. *confluens*, Aigner-Abafi describes (*Ent. Zeits. Guben*, xix., p. 209) a specimen exhibiting the combined characters of ab. *arcuata*, ab. *discoidalis-duplex*, and ab. *basijuncta*. The example figured by Oberthür (*Etudes*, xx., pl. iii., fig. 28) is very remarkable, the streaks on the forewings apparently being formed primarily by the development of extra spots between the submedian row and discoidal lunule on one side, and the basal spots and discoidal lunule on the other, as in ab. *addenda*, and then the whole of the spots secondarily united into longitudinal streaks. Montgomery has a similar, but less highly-developed, example in his collection. The finest example of the ab. *addenda* in our collection, has many extra dots between the submedian row and discoidal, and discoidal and basal spots on both forewings (see *infrà*). The best example of ab. *striata* that has come under our knowledge is that figured by South (*Ent.*, xxxiii., p. 281), in which every one of the normal spots on the underside of all four wings is extended into a black streak, so enlarged on the forewings that the ground colour of the wings looks black, with pale nervures crossing as far as the position of the normal submedian curved row of dots; the specimen was captured at Folkestone in July, 1900. A specimen, exhibiting a combination of obsolete and striate characters, captured near Eastbourne, September 5th, 1895, is noted (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 51), but the description there given is so vague, that we obtained the specimen from Montgomery, to see for ourselves its main characters. It has the basal spots of the forewings practically obsolete, but is of the *addenda* form between submedian spots 2 and 3 and the discoidal, whilst spot 5 of the submedian is lengthened; on the hindwings, submedian spot 1 is much extended, 6 also; the whole centre of the wing is spotless, and there are only two basal spots, but the most interesting points about the specimen are (1) that the white of the discoidal spreads over the whole central area of the wings, whilst (2) the submedian series of spots are pushed back on the marginal chevrons; these latter, in the forewings, are broadly white, with grey apices, in the hindwings also broadly white, but with orange apices; the margin thus looks particularly pale = ab. *mixta*, n. ab. The following are the described forms of the species with which we have met—

MALE FORMS.

α. ab. *argentea*, n. ab. *Adonis* ab., Obth., "Etudes," xx., p. 19 (1896).—♂. Silvery-grey above, dark grey beneath, without red marginal spots. Austria (Oberthür).

β. ab. *czekelii*, Aign.-Abafi, "Ent. Zeits. Guben," xix., p. 209(1906). *Bellargus* ab., South, "Ent.," xx., p. 80, no. 2 (1887); Webb, "Ent.," xxi., p. 133 (1888); Prideaux, "Ent. Rec.," iii., p. 8 (1892); Hodgson, "Ent. Rec.," xviii., p. 53 (1906). *Pallida*, Tutt, "Ent. Rec.," iii., p. 8 (1892).—The normal sky-blue tint of the upperside replaced by a blue-grey tint; on the underside, the marginal spots of the hindwings very weakly developed. Taken at Puszta-Peszér, Com. Pest, June 12th, 1898, by Dr. Czekelius (Aigner-Abafi).

This appears to be a greyer form of the ♂ than ab. *pallida*, still not without a blue tinge as is ab. *argentea*. The type, as noted above, was taken in Hungary, in 1898. South, in 1887, described (*Ent.*, xx., p. 80) a similar form: ♂. Grey, with pale mauve shade; fringes faintly chequered with pale grey; black spots on hind margins of hindwings indistinct; underside as in *bellargus;* taken in Kent, June, 1886. Webb notes four examples of a pure French grey colour (see *anteà*, p. 330). Prideaux recorded (*Ent. Rec.*, iii., p. 8) the capture of a specimen at Seaton, in September, 1891, described as of a pale lavender-grey colour, and quite lustreless. Hodgson reports (*Ent. Rec.*, xviii., p. 53) the capture of three ♂ s of a decided slaty coloration, taken ten days after the early September frosts of 1905, those taken before being quite normal.

γ. ab. *pallida*, Austin, "Ent. Rec.," i., p. 12 (1890); Ckll., "Ent. Rec.," i., p. 151 (1890); Tutt, "Brit. Butts.," p. 171 (1896); Mosley, "Vars. Brit. Lep.," p. 9, pl. iii., fig. 20 (1896); Tutt, "Ent. Rec.," xiv., p. 113 (1902); Wheel., "Butts. Switz.," p. 32 (1903). *Adonis* ab., Bell., "Ann. Soc. Ent. Fr.," p. 301 (1858); Weir, "Ent.," ix., p. 253 (1876); Tutt, "Ent. Rec.," iii., p. 270 (1892); Obth., "Etudes," xx., p. 18, pl. iii., fig. 26 (1896). *Bellargus* ab., Sabine, "Ent.," xix., pp. 176, 248 (1886); "Proc. Sth. Lond. Ent. Soc.," p. 61 (1886); South, "Ent.," xx., p. 80, nos. 7, 4, 6, pp. 294, 295 (1887); Sabine, "Ent.," xx., pp. 181, 222 (1887); Tutt, "Ent.," xx., pp. 207, 258 (1887); Webb, "Ent.," xxi., p. 133 (1888); Tutt, "Ent.," xxii., pp. 160-1 (1889); Tyrer, "Ent. Rec.," ii., p. 111 (1891); Pickett, "Proc. Sth. Lond. Ent. Soc.," p. 114 (1902).—The upperside of a pale lavender colour; the underside with the usual white rings but no spots, the rings being blind. Folkestone, 1889 (Austin).

This is the pale form of the ♂ of the species, which has been variously described as "pale lavender," "lilac," "pale lilac," etc., and may be compared in tint, rather with the very palest forms of *icarus*, than with the brilliant hues of typical *thetis*, but proved to be the latter by the chequered fringes and characteristic underside of this species. The name *pallida* is, of course, applicable only to the upperside coloration, on which peculiarity the name was given, although Austin's example had also the aberrational peculiarity of the underside known as ab. *albo-ocellata*. This peculiar aberration, often erroneously said to be confined to the Kentish chalkhills, was first recorded by Bellier de la Chavignerie (*Ann. Soc. Ent. France*, 1858, p. 301), who states that, on August 15th, 1847, he was in the Bois de Boulogne, where *adonis* was flying abundantly; the heat had been excessive, and a storm appeared imminent; that, on arrival on the ground, there was only time to pin five ♂ s, when a violent thunderstorm came on, and that later, he was astonished to find on examining the specimens captured, that they were of a beautiful lilac colour, instead of the brilliant shining blue normal to the species. He adds, that he vainly sought the form afterwards, and never saw it again. Three of these five ♂ s are now in Oberthür's collection, and the latter adds (*Etudes*, xx., p. 19) that he has two other examples, one from the "Ward coll.," labelled "Silesia," the other from the "Howard-Vaughan coll.," labelled "England." Oberthür figures (*op. cit.*, pl. iii., fig. 26) one of Bellier's examples. The earliest examples taken in Britain appear to have been some captured by ourselves and other collectors, between 1872 and 1875, on the downs above Halling, followed by others taken in 1885, on Bluebell hill, near Rochester, but Sabine was the first to record their capture. This he did in 1886 (*Ent.*, xix., pp. 176, 248), and exhibited the specimens at the meeting of the

South London Entomological Society held on October 7th, 1886, a report of the examples being given (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 61). He observes that he took, in Kent, seven ♂ s of a pale lilac or French grey colour, with ♀ s to correspond, the latter very pale brown or fawn, clouded with pale lilac and with pale orange spots; the ♂ s were taken, one on June 7th, one on June 10th, and five more on June 15th, whilst, on June 17th, one ♂ was seen, and four ♀ s taken (*Ent.*, xix., p. 176). On visiting the ground again in the autumn, he took two ♂ s and two ♀ s which were not so large as the spring examples. In exhibiting them, Sabine suggested (*Proc. Sth. Lond. Ent. Soc.*, p. 61) that these were hybrids of *A. bellargus* and *A. coridon.* One of these ♂ s and two ♀ s, together with other aberrational forms, were described in detail by South (*Ent.*, xx., p. 80, no. 7—♂, nos. 4, 5—♀ s), when he asserted, without further evidence, that these different aberrations were hybrids between *Polyommatus icarus* and *Agriades bellargus.* In June, 1887, Sabine reported (*Ent.*, xx., p. 181) the capture of further examples in Kent, and stated that he was now inclined to the view expressed by South, that the specimens were hybrid *P. icarus* and *A. bellargus.* We freely criticised these opinions (*Ent.*, xx., pp. 207, 257), as also did Briggs (*op. cit.*, p. 253), etc., as having no evidence to support them.[*] Webb then recorded (*Ent.*, xxi., p. 133) similar specimens, captured at Folkestone, 1887, whilst Austin captured several between 1887 and 1893 also at Folkestone, whence Pickett has recorded the same form as late as 1902. Tyrer further reported (*Ent. Rec.*, ii., p. 111) the capture of several of this pale form at Queendown Warren, on June 3rd, 1891. The form, however, is still a very rare one, and few collections possess what are known in common parlance as "pale *icarus*-coloured *bellargus*." Stollwerck notes that he once met, in the Rhine Provinces, *bellargus* that came near *alexis* (*icarus*) in tint, but with chequered fringes. Zeller notes a ♂ taken at Preth as light as *P. meleager;* but neither of these quite suggests our ab. *pallida.* Oberthür records (*Etudes*, xx., p. 19) an English ♂, from the "Prest coll.," having the right side of the normal sky-blue colour, the left side lilac-grey = ab. *particolor*, n. ab.

ε. ab. *nigra*, Ckll., "Ent.," xxii., p. 5 (1889); Tutt, "Ent. Rec.," xiv., p. 113 (1902). *Bellargus* ab., Sabine, "Ent.," xix., p. 176 (1886); "Proc. Sth. Lond. Ent. Soc.," p. 61 (1886); South, "Ent.," xx., pp. 80-81 (1887); Austin, "Ent. Rec.," ii., p. 273 (1891); Huckett, "Ent. Rec.," iv., p. 259 (1893); Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 77 (1894); Frohawk, "Proc. Sth. Lond. Ent. Soc.," p. 40 (1895); South, "Butts. Brit. Isles," pl. 118, fig. 5 (1906). *Urania*, Mosley, "Vars. Brit. Lep.," p. 95 *in part*, pl. iii., fig. 19 (1896). *Suffusa*, Tutt, "Brit. Butts.," p. 171 (1896); Wheeler, "Butts. Switz.," p. 32 (1903); Gillm., "Soc. Ent.," xviii., p. 156 (1904); "Int. Ent. Zeits.," iii., p. 64 (1909); Griebel, "Lep. Faun. der bayer. Rheinpfalz," i., p. 16 (1909). *Niger*, Ckll., "Ent. Rec.," ix., p. 331 (1897).—(1) ♂. Blue-black, with small black spots on the hind margins, and a dash of brownish colour along the inner margins of hindwings; nervures black, running through the whitish fringes; underside forewings smoky-grey, hindwings smoky-brown; spots as in typical *bellargus*, but enclosed in rings, which are but little paler than the colour of the wing upon which they are placed; the discoidal spot of hindwings pale but ill-defined. Kent, June, 1886. (2) ♂. Blue-black, somewhat darker than that just described; fringes chequered, dark grey and black; underside similar to last, but the discoidal spot of the hindwings obliterated (*Ent.*, xx., pp. 80-81).

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[*] We may here note concerning this controversy, that, in June, 1885, Sabine asked us to give him details of a locality where he might himself capture *A. thetis* (*bellargus*), a species that he had not, at that time, met with, that we introduced him in August, 1885, to the Cuxton locality, and gave him particulars regarding the Bluebell hill and Queendown Warren localities, from one (or all) of which the specimens, captured in 1886 and 1887, undoubtedly came. Tyrer notes (*Ent. Rec.*, ii., p. 111) that Sabine and he took the pale forms of *thetis* (*bellargus*), that Sabine recorded, at Queendown Warren.

Cockerell named (*Ent.*, xxii., p. 5) this form by reference to two examples exhibited at the meeting of the South London Entomological Society, held on October 7th, 1886, by Sabine (among other aberrations of *A. thetis*), and described as two "black" ♂s of this species, one captured in 1886, the other the preceding year, in Kent (*Proc. Sth. Lond. Ent. Soc.*, 1886, p. 61). The former of these two examples was recorded (*Ent.*, xix., p. 176) as captured on June 15th, 1886, and was described at length by South (*Ent.*, xx., p. 80) = (no. 1 *suprà*), who also diagnosed (*op. cit.*, p. 81) another example (no. 2 *suprà*), said to have been captured at Folkestone, in the autumn of "1884" (? 1885, as Sabine said "the previous year" when he exhibited them). Austin notes (*Ent. Rec.*, ii., p. 273) two ♂s taken at Folkestone, September 13th and 15th, 1891, of a dark slate, almost black, colour; whilst Briggs exhibited a dark leaden-coloured ♂, taken at Folkestone by Austin, on September 12th, 1892 (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77); Huckett records (*Ent. Rec.*, iv., p. 259) an unicolorous leaden-coloured ♂, taken at Folkestone, August 23rd, 1893, whilst a very dark blue-brown ♂, with conspicuous orange tips to the antennæ, taken at Folkestone in September, 1875, by W. P. Weston, was exhibited by Briggs at the meeting of the South London Entomological Society, November 8th, 1894, and Frohawk notices another (*Proc. Sth. Lond. Ent. Soc.*, 1895, p. 40) as dark leaden-blue, taken at Weymouth in August, 1892. It is also recorded as having been taken at Speyer by Griebel. Mosley's reference of this form (*Vars. Brit. Lep.*, p. 95) to *urania*, Gerh., with the remark "not uncommon in Turkey," appears to be a bad hit, not quite so amazing, however, as Dale's wild guess (*Hist. Brit. Butts.*, p. 66) about the same *urania*.

ζ. ab. **hyacinthus**, Lewin, "Ins. Gt. Brit.," p. 78, pl. lvii., figs. 4-6 (1795); Stephens, "List," 2nd ed., p. 18 (1856). *Adonis* ab., Hübn., "Eur. Schmett.," pl. lxi., fig. 298 (1799); Ochs., "Die Schmett.," i., pt. 2, p. 35 (1808); Klopsch, "Beit. Schles. Faun.," ix., pp. 212-214 (1829). *Albofimbriata*, Gillm., "Ent. Zeits. Guben," xix., p, 151, pl. xvi., fig. 2 (1905).—♂. Bright blue, without chequered fringes. ♀. Brown, well-scaled with blue; fringes not chequered on forewings, slightly chequered on hindwings. July, near Dartford (Lewin, *Ins. Gt. Brit.*, pl. lvii., figs. 4-5).

It is most unusual to find examples of this species with absolutely white fringes; the best one we have was taken at Sonzier, May 25th, 1909, by Alderson; the dark dashes are very faint in some eastern examples, especially in the hindwings, but there is no example with the fringes quite white in the British Museum coll. Ochsenheimer notes (*Schmett. Eur.*, i., pt. 2, p. 34) that the fringes of the ♂ are chequered black and white, though this is not always the case, for he has specimens before him in which the fringes of the hindwings are quite white, others in which the blackish ticks are very faintly developed also in those of the forewings. Hübner figures (*Eur. Schmett.*, pl. lxi., fig. 298) a ♂ with white fringes on the upperside, but his fig. 299, apparently the underside of the same insect, shows chequered fringes. Klopsch records (*Beit. Schles. Faun.*, ix., pp. 212-214) an example with white fringes, scarcely at all chequered on either upper- or underside, of all the wings, as a possible hybrid between this species and *P. icarus*, the fringes of the hindwings being else particularly free from dark marks. Gillmer describes and figures (*Ent. Zeits. Guben*, xix., p. 151, pl. xvi., fig. 2) a ♂, captured August 3rd, 1894, near Bozen, by Stange, with quite white fringes, as *albofimbriata*. We note the ♂ s in the Brit. Mus. coll. from Borjom, in Transcaucasia, and Urumiah in north-west Persia, as having well-chequered fringes on forewings, almost entirely white on hindwings, the ♂ s from Shar Deresy in north Syria, with very white, weakly-chequered, fringes on forewings, the dark marks on hindwings very faintly indicated; two ♂ s from Mount Olympus, and one from the Rilo Dagh, also show very faintly-chequered fringes on the hindwings.

η. ab. *puncta*, Tutt, "Brit. Butts.," p. 170 (1896); Wheeler, "Butts. Switz.," p. 33 (1903); Gillm., "Soc. Ent.," xviii., p. 157 (1904); Grund, "Int. Ent. Zeits. Gub.," ii., p. 87 (1908). *Bellargus*, Esp., "Schmett. Eur.," pl. xxxii. (supp. viii.), fig. 3 (1777); pl. lv. (contd. v.), fig. 2 (1778); Bergstr., "Nomen.," iii., pl. liii., fig. 5 (1779). *Ceronus* ♂, Hb., "Eur. Schmett.," pl. lxi., fig. 295 (1799); Staud., "Cat.," 3rd ed., p. 86 (1901); Stefan., "Bull. Soc. Ent. Ital.," xxxii., p. 338 (1900); " Verity, "Bull. Soc. Ent. Ital.," xxxvi., pp. 138-9 (1904). *Bellargus* ab., Lowe, "Ent. Rec.," p. 326 (1900). *Alfacarensis* ♂, Ribbe, "Soc. Ent.," xx., p. 138 (1905). *Parvipuncta*, Aigner-Abafi, "Ent. Zeits. Guben," xix., p. 209 (1906). *Punctifera*, Trautm., "Int. Ent. Zeits.," ii., p. 162 (1908).—♂, in which there is a series of small, but very distinct, marginal, black dots between the nervures of the hindwings (Tutt).

A series of antemarginal black spots on the hindwings is not an unusual development in the ♂. They sometimes number six or seven, the two last, near the anal angle, occupying a single interneural space. Those nearest the anal angle also appear usually to be the first developed. In some districts this spotting is comparatively rare, in others quite normal. Thus, in the ♂ s in our British collection, there are fifteen with them out of eighty specimens, but only six really well-marked; in our continental collection, 33 out of 124. They appear always to be placed at a little distance from the fine black terminal line, from which they are generally separated by the blue ground colour. Reverdin notes that, in his collection, out of 65 ♂ s, chiefly Swiss, 33 show this spotting weakly, and 11 strongly. Wheeler notes it as a special development in the specimens in the warm parts of Switzerland —June 4th, 1902, at Branson, May 13th, 1903, at Sion, Follaterre, etc.—whilst Lowe reports it from Orta, in Piedmont, where he says the ♂ s of the spring brood usually show well-marked black dots on the upperside of the hindwings, a feature apparently not so common in those of the Rhone valley. Knecht also records the form as frequent in May-June, 1894, in the Chiasso district. Blachier observes (*in litt.*) that, in the neighbourhood of Geneva, the ♂ s are often of the form *puncta*, the spots sometimes small, sometimes large, and may be as many as seven in number. Zeller notes that, at Bergün, the ♂ s are somewhat smaller than is usual in Germany, but specimens having the antemarginal row of black spots on the hindwings, are as frequent as those without them. He also notes the ♂ s taken in June at Flitsch and Preth to be about equally divided between *puncta* and the type. Verity observes (*Bull. Ent. Soc. Ital.*, xxxvi., p. 139) that, at Lucca, ♂ s with the series of marginal black spots on the hindwings are very common. We have well-developed examples from Saas-Fée, Bourg-St.-Maurice, Grésy-sur-Aix, etc., but the proportion in localities in the south of France—Digne, Draguignan, etc.—appears to be very small; Seebold, however, notes the form as common at Bilbao. Grund notes (*Int. Ent. Zeits.*, ii., p. 87) that the ab. *puncta*, Tutt, is very common in both broods in Croatia, near Podsused. In the British Museum coll., examples of ab. *puncta* are labelled—Brussa, Borjom, Asturias—Picos de Europa, Bergün, Zürich, Preth, Courmayeur, Trieste, Podolia—Bagovitza, Greece—Olympus, etc., so that the form is evidently very widely distributed. In the Spanish forms, the spots are sometimes small, sometimes large and approaching those of *punctifera*, Obth.; very strongly-developed spots are also shown in a ♂ from Estoril in Portugal. Esper figured this form of *bellargus* (*Schmett. Eur.*, pl. xxxii. [supp. viii.], fig. 3), and Bergsträsser also figured (*Nomen.*, iii., pl. liii., figs. 5-6) a fine deep blue ♂ *bellargus*, with a very characteristic series of interneural marginal spots on the hindwings. Aigner-Abafi renamed (*Ent. Zeits. Gub.*, xix., p. 209) the *puncta* form, as *parvipuncta*, noting that it inclined to var. *punctifera*, Obth., in that it had marginal spots on the upperside of the hindwings, the specimen described coming from Budafok. Many collectors have overlooked the fact that *punctifera*, Obth., is a very marked geographical race, of which the development of the marginal series of interneural dots is only one feature, and that by no means the most important, and one suspects that their references are rather to the ab. *puncta* than to the var. *punctifera*, *e.g.*, Trautmann notes (*Int. Ent. Zeits. Guben*, ii., p. 162) that, near Jena, the ♂ differs in the width of the black marginal band, and the size of the marginal spots, some examples being similar to the ab. *punctifera*, Obth. A similar form is recorded by Siépi, from the Bouches-du-Rhône. The *puncta* form is also reported from Germany—on the chalky slopes of the Mündelheim- and Budberg-streams, more frequent in the second brood (Rothke), etc.

FEMALE FORMS.

α. ab. *marginata*, Tutt, "Brit. Butts.," p. 170 (1896). *Bellargus*, Esper, "Schmett. Eur.," pl. lv. (contd. v.), fig. 4 (1778). *Latefasciata*, Schultz, "Int. Ent. Zeits.," xix., p. 214 (1906). *Rufomarginata*, Wagner, "Ent. Zeits. Stuttgart," xxiii., p. 17 (1909).—♀. Brownish-black, with no (or scarcely any) blue scales at base, but with bright orange-spotted margin to all the wings (Tutt).

This is a well-defined form of *A. thetis*, occurring in Britain more frequently in the second, than in the first, brood, and more abundantly in hot summers. The ground colour is generally browner than usual, the blue scaling almost, or entirely, absent, and the marginal orange or orange-red lunules especially well-developed. In the summer brood at Grésy-sur-Aix most of the ♀ s appear to be of this form, and Wheeler observes (*in litt.*) that the ♀ s taken at Fiesole, in mid-June (1909), have very broad and bright orange borders. Specimens in the British Mus. Coll. are labelled Trieste, Fuligno, Spalato, etc. The same form, with well-developed red lunules on all the wings, is also recorded by Wagner, from the neighbourhood of Zara, from Torbole on Lake Garda, etc.

β. ab. *tiphys*, Esp., "Eur. Schmett.," i., pt. 2, p. 3, pl. li. (contd. i.), fig. 4 (1778).—♀ Alis ecaudatis supra fuscis basi cærulescentibus, subtus cinereis ocellis oblongis numerosis. Upperside brown, tending somewhat towards light grey, without the slightest glaze; a white costal streak; the fringes chequered alternately with white and brown; a black discoidal spot surrounded to some extent by whitish-grey in the middle of the forewing; at the edge of the hindwing are found five such spots, the outer edge of which has a white, the inner a red, border, and which are, in addition, bordered by a black line. The underside of the forewings is light grey, the hindwings, however, somewhat more brownish or tinged with yellow; the eye-spots are, in position and form, very different from those possessed by any other species of *Argus;* at the base of the forewing is a spot drawn out into a longish oval, and near this a smaller one of black colour; a similar one in the form of a bow of remarkable length, parallel with the inner margin; the discoidal spot double, or like two joined together; this is followed by a row of five black spots in a bent line sloping across the wing; they are very broad and surrounded by white which loses itself in the ground colour; another row of large spots follows these, which are heart-shaped and of orange colour; the margin, near the fringes, is set with spots, which the nervures, in passing through, divide into separate pairs. The underside of the hindwings has, opposite the base, five spots broadly ringed with white; in the middle is a heart-shaped spot of clear white; a pair of these eye-spots are also placed opposite the inner margin, three stand further towards the middle, and two opposite the apex; the last is doubled; at the border are seven reddish-yellow spots with black edges; these are, moreover, surrounded with white. I am unacquainted with the other sex of this insect. The example here illustrated was found in the neighbourhood of Erlangen. It is in the rich collection of Herr Hofrath Rudolph (Esper).

This is a remarkable aberration of *A. thetis*, combining the characters of abs. *venilia*, *albicincta*, and *arcuata*. The figure may be described as— ♀. Black ground colour, with orange antemarginal markings on hindwings, but none on forewings; the discoidal of forewings edged with white; the bases of all wings tinged with dark blue. The underside with spot 6 of the submedian series united to the lower basal spots of forewings; hindwings with central discoidal white. Staudinger and other authors have unaccountably referred this figure to *A. coridon*.

γ. ab. *venilia*, Bergstr., "Icon. Pap. Diurn.," dec. i., pl. v., figs. 3-4 (1779); "Nom.," iii., p. 5, pl. l., figs. 3-4 (1779).—*P.P.R.* alis angulatis fuscis annulis posticarum senis fulvo coerulescentibus; subtus cinereis, maculis fulvis conicis post puncta marginalia tam in antica, quam in postica. Wings brown, with six yellow, bluish-bordered, rings or crescents on the hindwings. Beneath bluish-grey, with orange wedge-shaped spots edging the black marginal spots on both fore- and hindwings (Bergsträsser).

This is a ♀ form of *thetis* (*bellargus*), the ground colour of all the wings fuscous, their basal areas alone bluer, the hindwings only with an antemarginal series of orange lunules edged externally with blue. The underside with normal spotting.

δ. ab. *salacia*, Bergstr., "Icon. Papil. Diurn.," dec. i., pl. v., figs. 1-2 (1779); "Nom.," iii., p. 4, pl. l., figs. 1-2 (1779).—*P.P.R.* alis angulatis integerrimis fuscis maculis utrimque fulvis, subtus cinerascentibus. From *venilia* and *pampholyge*, which are perhaps only aberrations of *salacia*, the latter is best separated by the well-marked lunular spots on the forewings; these are very faint in *pampholyge*, and absent in *venilia*, etc. (Bergsträsser).

Bergsträsser's *salacia* is the ♀ form of *thetis* (*bellargus*), with the ground colour of the wings fuscous, tinged with blue at their bases; a submarginal series of reddish-orange lunules on all four wings, those of the hindwings ocellated and edged with blue externally. The underside is typical of a well-spotted ♀ of this species.

ε. ab. *urania*, Gerh., "Mon.," p. 17, pl. xxx., fig. 4 (1853). *Bellargus* ab., Hodgson, "Proc. Sth. Lond. Ent. Soc.," p. 89 (1907-8); Adkin, "Proc. Sth. Lond. Ent. Soc.," p. 93 (1908-9).—Var. *urania*, Bischoff; Turkey. This variety, kindly sent to me by Herr Bischoff, of Augsburg, is very strikingly different from the normal form. Herr Bischoff brought it from Turkey, where it is somewhat scarce (Gerhard).

Just as Gerhard erroneously calls the very blue ♀ he figures as *coronus* (pl. xxx., fig. 2*a*) a ♂, so he calls his figure of *urania* a ♂. It is, apparently, a ♀ of blackish tint, with blue scaling extending from the base to the discoidal cell on all the wings, leaving the outer margin broadly dark, without trace of orange marginal spots on any of the wings. Adkin records (*Proc. Sth. Lond. Ent. Soc.*, 1908, p. 93) the capture of a specimen in September, 1908, at Eastbourne, with the usual red lunular markings on the upperside of the margin of the hindwings, as well as those on the forewings, absent. [Dale's remark (*Hist. Brit. Butts.*, p. 67) that *urania*, Bischoff, “is a form of the ♂ found in Turkey . . . . . and is perhaps the same as *polona*, Zell., which occurs on the mountains of Asia Minor” (see *anteà*, pp. 323-325), is astounding.]

ζ. ab. *ceronus**, Esp., “Schmett. Eur.,” i., pt. 2, p. 178, pl. xc. (contd. xl.), fig. 2 (1784); supp. p. 50, pl. cii. (cont. lvii.), fig. 1 (1787); Jung, “Verz. der Schmett.,” p. 114 (1791); Hb., “Eur. Schmett.,” pl. lxi., figs. 295-7 (1796); Haw., “Lep. Brit.,” p. 44 (1803); Hofmsgg., “Ill. Mag.,” iii., p. 189 (1803); Herbst, “Nat. Sys. Ins.,” xi., p. 230, pl. 314, figs. 7-9 (1804); Ochs., “Die Schmett.,” i., pt. 2, p. 33 (1808); Dalm., “Handl.,” etc., p. 98 (1816); Latr., “Enc. Méth.,” p. 691 (1819); Godt., “Pap. Fr.,” i., p. 210 (1821); Curt., “Brit. Ent.,” fo. 6 (1824); Stphs., “Ins. Cat.,” p. 24 (1829); Bdv., “Eur. Lep. Ind.,” p. 12 (1829); Meig., “Eur. Schmett.,” ii., p. 23, pl. xlviii., figs. 3*a-b* (1830); Dup., “Pap. Fr.,” supp. i., p. 432 (1832); Nick., “Böhm. Tagfalter,” p. 14)1837); Ramb., “Faun. And.,” p. 272 (1839); Bdv., “Gen. et Ind. Meth.,” p. 12 (1840); Humph. and Westd., “Brit. Butts.,” p. 106 (1841); Neust. and Korn., “Schmett. Schl.,” p. 47 (1842); Dup., “Cat. Méth.,” p. 33 (1845); Stphs., “List,” 1st. ed., p. 20 (1850); Heydrch., “Lep. Eur. Cat. Meth.,” p. 14 (1851); Meyer-Dür, “Schmett. Schw.,” p. 82 (1851); Westd. and Hew., “Gen. Diurn. Lep.,” ii., p. 493 (1852); Freyer, “Neu. Beitr.,” vi., p. 14 (1852); Wallgrn., “Skand. Dagf.,” p. 224 (1853); Westwood, “Butts. Gt. Britain,” p. 109 (1855); Stphs., “List,” 2nd ed., p. 18 (1856); Koch, “Schmett. Südwest. Deutsch.,” p. 29 (1856); Speyer, “Geog. Verb.,” ii., p. 273 (1858); Zebr., “Lep. Krak.,” p. 158 (1860); Girard, “Ann. Soc. Ent. Fr.,” 4th ser., v., pp. 111-114 (1865); Fallou, “Bull. Soc. Ent. Fr.,” p. 1 (1865); Nowicki, “Lep. Gal.,” p. 51 (1865); Berce, “Faun. France,” i., p. 142 (1867); Kirby, “Syn. Cat.,” p. 367 (1871); Staud., “Cat.,” 2nd ed., p. 12 (1871); Curò, “Bull. Soc. Ent. Ital.,” vi., p. 112 (1874); Dubois, “Lép. Belg.,” p. 32 (1874); Mill., “Cat. Lép. Alp.-Mar.,” p. 103 (1875); Sand, “Cat. Lép. Ber. Auv.,” p. 6 (1879); Frey, “Lep. Schweiz,” p. 19 (1880); Kirby, “Eur. Butts.,” p. 48 (1882); Lang, “Butts. Eur.,” p. 121, pl. xxvi., fig. 5 (1884); Kane, “Eur. Butts.,” p. 44 (1885); Dale, “Hist. Brit. Butts.,” p. 67 (1890); Brom., “Butts. Riv.,” p. 39 (1892); Rühl, “Pal. Gross-Schmett.,” p. 276 (1895); Tutt, “Brit. Butts.,” p. 170 (1896); Kirby, “Handbook,” etc., ii., p. 95 (1896); Favre, “Macr.-Lep. Val.,” p. 20 (1899); Fleck, “Macr.-Lep. Rum.,” p. 21 (1901); Staud., “Cat.,” 3rd ed., p. 86 (1901); Lamb., “Pap. Belg.,” p. 236 (1902); Wheeler, “Butts. Switz.,” p. 32 (1903); Gillm., “Soc. Ent.,” xviii., p. 156 (1904); South, “Brit. Butts.,” p. 170 (1906). *Caerulea*, Sweetg., “Ent. Rec.,” xix., p. 306 (1907).—*P. Plebeius Ruralis ceronus*. Alis ecaudatis cæruleis nigro-inductis, omnibus fascia maculati ad marginem fulva, ciliis albo nigroque tesselatis, omnibus subtus fuscis, ocellis numerosissimis. This new kind of *Argus*, conspicuous for its brilliant colour, has lately been found in the neighbourhood of Pressburg, in Hungary, by Herr Rummel. In the number and position of the eye-spots, it is almost identical with *P. meleager*, except that it shows, near the base of the forewing, in the majority of cases, an eye-spot which I have never observed in that species; also, the ground colour of the underside is much darker and more tinged with brown. The most noticeable distinction is afforded by the perfectly regular outline of the hindwing, in which there is nothing in the way of points or outstanding angulations, as in *meleager*; it is, on the other hand, adorned with quite regular fringes, which, at the nervures, have a blackish colour. The margin of all the wings exhibits, on both sides, a row of deep red spots with black dots, which we never find in *meleager*. This gives it a sufficient right to rank as a separate species (Esper).

Reference to von Rottemburg's original description of *thetis* (*anteà* p. 326) will show that Esper's *ceronus* is practically identical with the more striking blue form of what von Rottemburg calls his ♂ *thetis*, “beautiful blue above, with blackish shade along costa of forewings,” etc. Esper gives two figures of *ceronus* (*Eur. Schmett.*, pl. xc. [cont. xl.), fig. 2, and pl. cii. [cont. lvii.], fig. 1). The former was figured from an example taken near Pressburg, in Hungary, the latter from one captured in Wallachia. The first is described above, the second was noted (*op. cit.*, supp. p. 50) as an aberration of *ceronus*, of which Esper thought it might be the ♂, noting it as "having a similar blue upperside, with black costa, nervures, and square-spotted margins, only the reddish-yellow antemarginal spots are wanting on the forewings, whilst the hindwings have the same colour and pattern as *ceronus*, except that, instead of the bright red angular antemarginal spots, this has only four similarly-coloured small dots which are still more finely bordered with black above. The undersides of the two examples are similar, but the spots are smaller in the Wallachian example, whilst the discoidal of the hindwings is absolutely whitish, the pale colour spreading over the median area of the hindwings." This is, of course, our *semiceronus*. Esper's figure of this Wallachian example hardly tallies with his description (*suprà*); it is rather a fancy figure of bright royal blue colour, with black costa and outer margin; the discoidal circular, and ringed with white; four orange interneural spots on hindwings, none on forewings; underside spotting nearly normal, with only one basal spot to forewings. The original figure of *ceronus* (*Eur. Schmett.*, pl. xc. [cont. xl.], fig. 2) may be described as large; the ground colour dark blue, reaching from the base to the orange-band in all the wings; the costal margin of the forewings blackish, the forewings with dark discoidal; the orange-red band of forewings well-developed, reduced to lunules on the hindwings; the ground colour of the underside dark brown, with well-developed spots, and orange-red antemarginal band; only one basal spot to forewings, the discoidal lunules black. The specimens in the British Museum coll. that approach nearest to Esper's figure of *ceronus*—with dark costa, dark nervures, and orange on all the wings—have come from Algeria (Elwes), Central France (Sand), and Göttingen (Leech coll.). Hübner figures (*Eur. Schmett.*, pl. lxi., figs. 295-7) under this name, a ♂ of the form *puncta*, and a ♀ which may be included under *ceronus* (*-lunulata*), blue to the margin of all the wings, a dark linear discoidal lunule, narrow black costal and outer margins to forewings, orange lunules on hindwings, and traces of the three lowest ones on forewings. Gerhard figures (*Mon.*, pl. xxx., figs. 2*a*-*c*) a fine wholly blue ♀ with orange antemarginal spots = ab. *coelestis*, Obth., as ♂ *ceronus*, and as ♀ *ceronus*, a quite ordinary ♀ of *A. thetis*, approaching ab. *venilia*, the forewings wholly fuscous, except a mere trace of orange marginal spots, the hindwings blue from the base to the antemarginal row of well-developed orange spots, but the costa wholly fuscous, neither form, therefore, belonging to *ceronus*. It is clear that the name *ceronus* must be limited to those blue ♀s of *thetis* with the costa and the nervures of the forewings brownish or blackish, which are broadly the characters of Esper's *ceronus*. Muschamp notes (*Ent. Rec.*, xvi., p. 221) the ♀ of the spring brood as very brilliant in Majorca, with blue extending beyond the orange borders to the fringe. The form *ceronus* occurs in both broods, for Jones notes it as occurring June 5th, 1890, at Digne, Forbes, at the end of August, 1876, at Bellagio, Wheeler on September 1st, 7th, 1899, at Sierre, Nowicki at Janow in June, and on the Limberg sandhills in August. The ab. *ceronus* is recorded (one suspects often erroneously, and without knowledge of Esper's form) from most localities in which the species is found. It is noted as very rare in Switzerland—Basle (Knecht), Liestal (Christ), Sierre, Villars (Wheeler), Berne (Jäggi), Gruyères, near Bulle (Rowland-Brown), Jura, very fine examples (Agassiz), Geneva district (Blachier); as rare in Belgium (Lambillion); in Hungary, rare—Budapest, Nagyvárad, Pozsony, N. Lévárd, Tavarnok, Eperjes (Aigner-Abafi); in Austria—Bohemia (Nickerl); Lower Austria—Hernstein, singly (Rogenhofer); in Galicia—Janow, and the Limberg sandhills (Nowicki); Dalmatia (Mann); in Germany, distributed, East and West Prussia—Graudenz (Riesen), Osterode, Allenstein, Danzig (Speiser); Hanover—Lüneburg, singly (Machleidt and Steinvorth); Rhine Provinces—Crefeld, rarely with the type (Rothke); Westphalia—Warburg, singly (Uffeln); Hesse-Cassel, singly (Borgmann); Waldeck—in the Quast (Speyer); Thuringia—Jena, rare (Jordan); Province of Saxony—the Steigerwald, singly (*Ent. Ver. Erfurt*), Seeben, Gutenberg, etc., singly (Stange); Hartz—Achtermanns-Höhe, once, June 21st, 1870, the only time the species was ever seen in the Upper Hartz (Hoffmann); Silesia—rare, with the type (Wocke); Kingdom of Saxony—Deuben, near Dresden, occasionally (*Ent. Ver. Dresden*); Bavaria—Augsburg, rare (Freyer); Württemberg—Reutlingen, rare (Keller and Hoffmann); Baden—Constance, Lahr, Speier, Weinheim (Meess and Spuler). In France it is also reported as scarce; it is noted from Alpes-Maritimes—St. Martin-Vésubie (Bentall); Ardèche—Celles-les-Bains (coll. Fallou); Basses-Alpes—Digne (Jones); Bouches-du-Rhône—St. Pons, Eaux-Vives, near Aix, Beaureceuil (Siépi); Cher—St. Florent (Sand); Charente-Inférieure—Royan (Dupont); Dordogne—Jaures, la Turquie, Queysac, Simonet (Tarel); Haute-Marne—Langres (Frionnet); Hautes-Pyrénées, frequent (Rondou); Haute-Savoie—Monnetier (Blachier); Indre—Gargilesse (Sand); Loir-et-Cher—nr. Blois (*cit.* Kane); Maine-et-Loire—Milly (Delahaye); Marne—Soulain wood, Rheims (Demaison); Pyrénées-Orientales—Vallée du Lys (Keynes); Seine-et-Marne—Fontainebleau (Berce); Seine—nr. Paris (*cit.* Kane). In Spain it is noted as occurring in Catalonia—Barcelona, rare (Korb); Asturias—Bilbao, common (Seebold). In Italy, it is recorded from Lombardy—Bellagio (Forbes), Piedmont—Orta, (Lowe), Tuscany—Florence (Stefanelli), Lucca (Verity), etc. In Roumania, near Slivno, at end of May (Rebel). In Asia Minor—coast of Cilicia, April, 1895 (Holtz), Amasia, rare (Staudinger), Brussa, rare (Mann).

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* It is quite impossible to separate the references to *ceronus* into those referable to the various blue ♀ forms of this species. One suspects that only a small number of those actually quoted, are really referable to the very striking form first figured by Esper under this name.

η. var. (et *ab.*) *coelestis*, Obth., “Bull. Soc. Ent. France,” pp. 23-26 (1908); “Lép. Comp.,” 3rd fasc., pl. xix., figs. 65-68 (1909). *Ceronus*, Pierret, “Ann. Soc. Ent. Fr.,” ii., p. 119 *in part* (1833); Gerh., “Mon.,” pl. xxx., fig. 2*a* (1853); Trimoulet, “Cat. Lép. Gironde,” p. 15 (1858); Girard, “Ann. Soc. Ent. Fr.,” ser. 4, v., pp. 111-114 *in part* (1865); South, “Ent.,” xx., pl. ii., fig. 12 (1887); *Bellargus* ab., Austin, “Ent. Rec.,” ii., p. 273 (1891); Briggs, “Proc. Sth. Lond. Ent. Soc.,” p. 77 (1894).—Neither of the two figures of *ceronus*, (1) from Pressburg (*Schmett. Eur.*, pl. xc. [cont. xl.], fig. 2), (2) from Wallachia (pl. cii. [cont. lvii.], fig. 1), given by Esper, nor that represented by Hübner (*Eur. Schmett.*, pl. lxi., fig. 297), agree with the blue ♀ of *bellargus* from western France, indeed, following the description of Esper “alis ecaudatis caeruleis nigro-inductis,” and in accordance with the figures in Esper's and Hübner's works, the ♀ form *ceronus* has the costa of the forewings and the nervures black. This character is clearly shown in certain blue ♀s of *bellargus*, particularly in the Algerian form. On the contrary, the blue ♀s of *bellargus* from la Vendée, the Charentes, and the Bordelais, have the costal edge of the forewings more silvery, as well as the wing-nervures; on this account, the upperside is entirely sky-blue, with a silvery sheen, so that neither the costal area nor, particularly, the nervures, are browned. A margin of crimson spots surmount the black marginal punctuation, enhancing the appearance of this charming butterfly, which I distinguish under the name *coelestis*, n. var. This name applies exclusively to the blue forms of *bellargus* met with from la Vendée to the neighbourhood of Bordeaux, along the littoral, and extending relatively only a very short distance inland . . . . . This western France form of the ♀ *mariscolore* of *bellargus*, is well-known to the lepidopterists of this country, and exists in their collections. Trimoulet, in his *Cat. des Lép. du dépt. Gironde*, p. 15, observes that "the *ceronus* of the Gironde is remarkable for the brilliance of the blue colour which it attains, surpassing even that of the ♂ *bellargus*," but he goes no further . . . . At Auzay, Dompierre, and Angoulême, the var. *coelestis* is always similarly characterised (Oberthür).

The form appears to have been first noticed by Pierret (*Ann. Soc. Ent. France*, ii., p. 119) who, in 1833, states that it appeared to be very common near Bordeaux, whence it had been sent in large numbers by M. Auguste. He notes an example taken by Bellier in Seine-et-Marne at Gurcy, which differed in no way from those sent from Bordeaux. Gerhard, in 1853, figured a wholly blue ♀ with marginal orange spots, calling it the ♂ *ceronus*, figuring as ♀ *ceronus* (fig. 2*c*) a quite ordinary ♀ of the species. Oberthür suggests the restriction of the name to the Western France examples, but Trautmann notes (*Int. Ent. Zeits. Guben*, ii., p. 162) a bred specimen from Jena without a trace of a brown scale on the uppersides, and Briggs records (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77) a ♀, taken by Austin, at Folkestone, in 1891, in which the whole of the wings are of the ♂ coloration, except the hind marginal row of ocelli; this example was described (*Ent. Rec.*, ii., 273) as having merely a row of black spots inside the fringes of the upperside of the forewings, and a row of bright red spots on the margin of the upperside of the hindwings. Blachier, comparing *coelestis* (received from Oberthür) with *ceronus*, notes (*in litt.*) the following details:

1. The costal margin of *coelestis* is not black or shaded with black, but blue like the rest of the wings, sometimes powdered with black or grey scales; now and then the nervures adjacent to the costal border are silvery-white.
2. The surface of the forewings is blue, without black or blackish, except the discoidal lunule of the forewings; a narrow black line preceding the fringe; this line in turn preceded by a shade in which the black spots, often well-marked, are situated, either resting on the marginal line or isolated; these black spots are surmounted with crimson spots, very marked on the hindwings, weak on the forewings; these red spots are not surmounted with black chevrons as in the *ceronus* of collections.
3. The blue of *coelestis* is extremely brilliant, and recalls the tint of the ♂ with its various shades.

θ. ab. *radiata*, Gaschet, "Bull. Soc. Ent. Fr.," p. lxiii (1877).—♀. The nervures of the hindwings of a brilliant azure blue, the interneural spaces of a deep blue, encroaching on the black, and radiating in the direction of the outer margin; just before the marginal spots the dark tint is effaced, and the azure blue alone remains. The black marginal spots are adorned with yellow lunules, as in the ab. *ceronus*. The forewings show the same characteristics as the hindwings, but rather less prominently; the tints are a little deeper. Floirac, near Bordeaux. Rare (Gaschet).

One wonders whether this is not the oldest description of the *coelestis* form, "Bordeaux" being particularly noted by Oberthür as one of the localities for *coelestis* in his description of the latter.

i. ab. *irregularis*, n. ab. *Adonis* ab., Girard, "Ann. Soc. Ent. France," ser. 4, v., pp. 111-114, pl. ii., figs. 4-5 (1865).—♀. The wings showing different varietal forms.

Girard notes (*Ann. Soc. Ent. Fr.*, ser. 4, v., pp. 111-114) a ♀, the right forewing of which is of the blue ab. *ceronus*, the three others being of the brown type. This example is also of the extreme form *obsoleta* on the underside. Coll. Fallou. Captured on the slopes of the fortifications in the Bois de Boulogne, by Caroff, in early August, 1864.

LOCAL RACES.

α. var. *alfacarensis*, Ribbe, "Soc. Ent.," xx., p. 138 (1905).—I have before me a whole row of ♀s of *Lycaena bellargus*, from the Sierra de Alfacar, taken in the years 1880, 1881, and 1905, which differ throughout from the type.* The general coloration is grey-brown, whilst the yellow marginal band of the fore- and hindwings, which, in *bellargus* ♀s, is only weakly expressed,† stands out quite sharply; in some examples it forms a band of 3mm. in width, running along the outer margin. The black markings in the white fringes are quite sharply contrasted. The underside is brownish, and furnished with larger, more striking, white-bordered, black dots. One may consider as the ♂s of *alfacarensis*, those very intense blue-coloured specimens which stand between *bellargus* and var. *punctifera* (Ribbe).

This is a somewhat vague and unsatisfactory description of a local race; indeed, no characters, not found elsewhere in the species, appear to be sufficiently defined to seize with any certainty, except, perhaps, the pale ground colour of the ♀s. The ♂s appear to be referable to ab. *puncta*, the ♀s to a form near ab. *marginata*, but with paler ground colour, and the orange spots united on all the wings into a comparatively broad band.

β. var. *punctifera*, Obth., "Etudes," i., p. 23 (1876); Rühl, "Pal. Gross-Schmett.," v., pp. 276, 763 (1893-5); Tutt, "Brit. Butts.," p. 171 (1896); Staud., "Cat.," 3rd ed., p. 86 (1901); Wheeler, "Butts. Switz.," p. 33 (1903); Gillm., "Soc. Ent.," xviii., p. 157 (1904); Fountne., "Ent.," xxxix., p. 108 (1906); [? Grund, "Int. Ent. Zeit.," ii., p. 162 (1908).] *Punctigera*, South, "Ent.," xx., p. 79 (1887); Obth., "Etudes," xx., p. 18 (1896); "Bull. Soc. Ent. Fr.," p. 25 (1908).—Lambessa; where one finds a very remarkable form. It is very brightly coloured, the hindwings of the ♂ marked above, near the fringe, with a border of large black spots. Among the ♀s, some are blue, and are referable to the var. *ceronus*, others are brown, like those taken near Paris; lastly, others are intermediate between the two extremes . . . . . . Also at Magenta, in October; Sebdou, in September, flying among the "broussailles de lentisques," on which this charming Lycænid loves to rest. The first brood flies in May (Oberthür).

In the British Museum coll. are four ♂s from Lambessa, captured May 12th, 1881. They are of a pale blue, with well-marked chequered fringes; a well-developed row of interneural spots on the hindwings, together with a distinct trace of an analogous interneural series on the forewings, suggesting a somewhat broad marginal border, though the real marginal line is as sharply linear as (though slightly wider than) in other examples. There are three ♀s; one, labelled "Lambessa, 12. v. '82 (Elwes)" is large, dark, slightly tinged with blue, the orange on the hindwings well-marked, on forewings almost obsolete; except for its large size, the specimen looks nearly typical; two others, labelled "Lambessa, June, '85 (Bleuse)," and "Algeria, ex Staudinger," respectively, are bright blue from margin to base, with dark nervures on forewings, which accumulate in lower half of costal area into a dark band, leaving in the apical half interneural blue lines; the forewings with a series of outermarginal black spots, edged with pale blue inwardly, the three lower in turn with red lunules, again edged inwardly with blackish; the hindwings entirely blue to margin, with an outermarginal series of black interneural dots as in ♂, edged with red crescents. These two ♀s present a very coarse appearance, and are, strangely, nearer to Esper's original figure of *ceronus* (*Schmett. Eur.*, pl. xc. (cont. xl.), fig. 2) than any other of the long series of ♀s in the collection. Blachier notes (*in litt.*) of five ♂ *punctifera* in his collection, that the black interneural dots on the upperside of the hindwings are very large and round in two ♂s, smaller and triangular in a third; four have also well-marked interneural spots on the forewings, impinging on the black line that edges the fringe, the black line being thicker than in normal European ♂s; the extremities of the nervures are black. The only ♀ he has is brown, slightly powdered with pale blue scales, the hindwings with large orange lunules, and with big marginal dots, edged exteriorly with little white arcs. He further notes that a ♂ from Sebdou has the black dots in cellules 2 and 3 on the upperside of the hindwings, surmounted with small, rather indistinct, red spots; Miss Fountaine also records the capture, among others, at Sebdou, in July, 1904, of a ♂ in which there were orange spots on the upperside of the hindwings; this form is certainly sufficiently striking to be named, and we would call it ab. *rufolunulata*, n. ab.; Walker notes (*Trans. Ent. Soc. Lond.*, 1890, p. 373) that "summer examples of the ♂, taken in the Straits of Gibraltar district, S. Roque, etc., have a submarginal row of bright orange dots on the upperside of the hindwings. [Grund observes that a ♂ taken in Croatia, at Podsused, on May 19th, 1906, perfectly represents the ab. *punctifera*, Obth., the black marginal spots of the hindwings large, and separated from the margin by a white edging, whilst, on the forewings, also, is a row of small black spots before the outer margin. One is chary about accepting this as referable to *punctifera*, which only stands as the geographical race from Mauretania.] The nearest ♂ in the British Museum coll. to *punctifera*, is one from Estoril in Portugal, the nearest ♀, one marked "Hispania, Leech coll.," which, however, shows discoidal lunules in the hindwings, as well as in the forewings, which the Algerian examples do not; the shade of red is similar in both, but the Spanish has less blue, and what there is, is less bright. Staudinger notes (*Cat.*, 3rd ed., p. 86) the colour of the ♂ as "viridicæruleus;" we have not noticed any "green" tinge in the ground colour of the ♂s that we have examined.

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* It would be interesting to know what Ribbe considers the ♀ type. The original description of *thetis*, v. Rott., appears to include a pretty wide range of ♀ forms.

† This is a very dubious statement; many ♀s of *bellargus* have most strongly marked orange-red marginal bands.

Both Sexes (Upperside).

a. ab. *minor*, Tutt, "Brit. Butts.," p. 171 (1896); Muschamp, "Bull. Soc. Lép. Genève," i., p. 264 (1908). *Bellargus* ab., Bond, "Proc. Ent. Soc. Lond.," 1868, p. xlii (1868); Staud., "Hor. Soc. Ent. Ross.," xvi., p. 66 (1881); Tutt, "Ent.," xx., p. 324 (1886).—Specimens of both sexes of not more than two-thirds the normal size, especially frequent in the late brood, following hot, dry summers (Tutt).

Small examples are not at all infrequent in the autumn brood in most Kent localities; in some seasons (*e.g.*, 1887, 1893, etc.), a very fair proportion is small. Staudinger notes in his "Lepidoptera of Asia Minor" (*Hor. Soc. Ent. Ross.*, 1881, p. 66), that Johann sent him a specimen which only measured 21mm. in expanse, smaller, therefore, than many *Cupido minimus*. Muschamp records the capture of some small examples, 24mm. and less, at Hermance and Gaillard, near Geneva, during the second week of June, 1907. Rowland-Brown records two exceptionally small examples in the Val Muerta, near Beaulieu, and a small ♂ at Digne, in October, 1902. Bond exhibited (*Proc. Ent. Soc. Lond.*, 1868, p. xlii) at the meeting of the Entomological Society of London, a ♂ of extremely small size. Others have already been mentioned, *anteà*, p. 336.

UNDERSIDE ABERRATIONS.

a. ab. *striata*, Tutt, "Brit. Butts.," p. 171 (1896); Wheeler, "Butts. Switz.," p. 33 (1903); Musch.. "Ent. Rec.," xix., p. 187 (1907). *Adonis* var. *β*, Stphs., "Illus. Haust.," i., p. 90 (1828). *Bellargus* ab., [Bond, "Proc. Ent. Soc. Lond.," p. xlii (1868);] [Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 77 (1894);] South, "Ent.," xxxiii., p. 281 and fig. (1900); Joy, "Proc. Ent. Soc. Lond.," p. xl (1902); [Leonh., "Ent. Zeits. Guben," xviii., p. 54 (1904);] [Aign.-Abafi, "Ann. Mus. Nat. Hung.," p. 516 (1906);] South, "Butts. Br. Isl.," pl. cxix., fig. 4 (1906).—The spots extended or united lengthwise to form streaks (Tutt).

This name was given to include the many known aberrations of this species in which the spots on the underside of the wings are elongated or united into the form of streaks. Many different minor striate forms in our collection were brought together under this name, for which it was thought inadvisable to find different names. Since then, however, many of these very common aberrations have been separately named by Courvoisier and others, and, as they fall into two groups, *viz.*, (1) those which have become striate owing to the extension of the normal spots, (2) those which have become striate owing to the union of two or more spots, it may be well, henceforth, to restrict the name *striata* to the first group, and call the second *conjuncta*. One of the earliest recorded examples of this restricted *striata* form, is that noted as having been exhibited by Bond, December 7th, 1868, and described (*Proc. Ent. Soc. Lond.*, 1868, p. xlii) as a ♂ with a number of broad bars of black on the underside of the forewings. Nussey records (*Proc. Sth. Lond. Ent. Soc.*, 1893, p. 44) an aberration in which the spots beneath are developed into broad streaks. Joy also exhibited a ♂, described (*Proc. Ent. Soc. Lond.*, 1902, p. xl) as being striped on the underside. The finest specimen of the ab. *striata* (*sens. restr.*) known to us, is that figured (*Ent.*, xxxiii., p. 281) by South, and described as a ♂, captured at Folkestone in July, 1899, in which every spot on the underside of both fore- and hindwings, is lengthened in the direction of the base, including not only the spots of the submedian rows, but also the basal spots; the ground colour of this particular example is whitish, clouded with grey, the ordinary antemarginal orange lunules being in their usual position, but falling, in this example, at the outer extremities of the black bars on the hindwings.

β. ab. *partim-radiata*, Obth., "Etudes," xx. (p. 18), pl. iii., fig. 28 (1896). *Bellargus* ab., Bond, "Proc. Ent. Soc. Lond.," p. xlii (1868); Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 77 (1894); Aign.-Abafi, "Ann. Mus. Nat. Hung.," p. 516 (1906). *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896). *Adonis* ab., Mosl., "Nat. Journ.," pl. iii., fig. 23 (1896). *Radiata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22 (1903). *Digitata*, Courv., "Zeits. für wiss. Ins.," iii., pt. 2, p. 36, pl. i., fig. 22 (1907).—The spots on the underside of the forewings developed into streaks, and confluent with the discoidal and basal spots, captured at Villeneuve-de-Blaye, Dept. Gironde, by Mège (Oberthür).

This form was included in our ab. *striata* (*sens. lat.*), and will fall before the latter name, if one name be used to include all the striate forms. It is a most interesting form, and the development of the streaks through ab. *addenda* is well shown in Oberthür's figure. Two almost exactly similar forms have been noted—(1) Briggs exhibited (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77), at the meeting of the South London Natural History Society, held on November 8th, 1894, a ♂ from Folkestone, in which the row of submarginal spots on the forewings are developed into streaks, radiating towards the discoidal spot, which, in turn, is connected by a streak with the basal spot. (2) Aigner-Abafi notes (*Ann. Mus. Nat. Hung.*, 1906, p. 516) a specimen in the "Treitschke coll.," in which all the spots on the underside of the forewings are more or less elongated, as well as those on the costa of the hindwings. Courvoisier evidently only redescribes Oberthür's figure. Montgomery has an example in his collection closely allied to *subtus-radiata*, in which, also, there is distinct evidence (as in Oberthür's figure) that the streaks uniting spots 2 and 3 of the submedian series to the discoidal on the right forewing, are made up of united dots; extra dots between spots 1 and 4 of the submedian, are also present, but not united into streaks; on the left forewing, the streaks between spots 2 and 3 of the submedian series and the discoidal, are still better developed as streaks, but there are no dots between spots 1 and 4 and the discoidal; nor are there in this specimen, extra spots between the basal spots and discoidal. An example is noted (*Ent. Zeits. Guben*, xviii., p. 54) by Leonhardt as being captured June 3rd, 1904, at Hüningen, and is described as a ♂, in which the spots forming the curved row on the underside of the forewings, are elongated like drops towards the discoidal lunule, that in the space between nervures III_2 and III_3 almost touching the latter.

γ. ab. *postico-striata*, n. ab. *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896).—The underside of the forewings with normal spotting, the hindwings with the spots of the submedian series elongated towards the discoidal spot.

This form also was included in our *striata*, *sens. lat.*, but if the aberration with the spots of the forewings alone developed into streaks, is to be separately named, that in which the spots of the hindwings alone are similarly developed, will want separate treatment.

δ. ab. *semiarcuata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 20 (1903). *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896).—Specimens in which the confluence between the basal and lowest spots of the curved submedian row is not complete, may be called *semiarcuata* ♀ (Courvoisier).

A common aberration in both sexes, that was included in our *striata*, *sens. lat.* Blachier and Reverdin note it as not at all rare in the Geneva district. We have seen examples of the form *arcuata* on one side, and *semiarcuata* on the other, as noted by Courvoisier.

ε. ab. *costajuncta*, n. ab. *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896).—The first basal spot and the upper spot of the submedian row on the underside of the hindwing united.

ζ. ab. *basijuncta*, n. ab. *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896).—The penultimate basal spot, and the penultimate spot of the submedian row on the underside of the hindwings united.

η. ab. *arcuata*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 21 (1903); Grund, "Int. Ent. Zeits.," ii., p. 87 (1908). *Tiphys*, Esp., "Schmett. Eur.," pl. li. (contd. i.), fig. 4 (underside) (1778). *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1906).—The lower basal spot or spots united to the lower spot or spots of the curved submedian row of the underside of the forewings (Courvoisier).

Three more common aberrations of the underside of this species, included under our ab. *striata*, *sens. lat.* Courvoisier refers (*Mitt. Schw. Ent. Gesell.*, xi., p. 20) under his "formæ confluentes simplices" to the above three striate forms—(1) Showing union of the first basal spot and first spot of the curved row of the hindwing (two ♀ s) = *costajuncta* (*suprà*). (2) Union of the penultimate basal spot and the penultimate spot of the curved row of the hindwing, the streak formed being parallel with the inner margin (♂ and ♀) = *basijuncta* (*suprà*). (3) Union of the last or last two basal spots, and the last two of the curved row of spots of the forewings (♀), *i.e.*, analogous with *Polyommatus icarus* ab. *arcuata*, Weym. Grund observes that, near Podsused, in Croatia, the ab. *arcuata* is common in the ♀ s of both broods. Reverdin reports (*in litt.*) it from the Geneva district, where also Blachier says (*in litt.*) that not only *arcuata* but the forms *semiarcuata* and *c-nigrum* are not rare. Indeed, parallel forms to almost all the minor aberrations of the *conjuncta* form mentioned under *Plebeius argus* (*anteà* pp. 178-179) are to be found in this species. The peculiar feature of this ab. is one of the main characteristics of *tiphys*, Esp., described and figured more than 130 years ago.

θ. ab. *confluens*, Aigner-Abafi, "Ent. Zeits. Guben," xix., p. 209 (1906). *Striata*, Tutt, "Brit. Butts.," p. 171 *in part* (1896).—The upperside normal, the underside dark, the basal spots and the discoidal lunule double; the spot lying in cell 2 is elongate in a curved manner towards the base, as in *Polyommatus icarus* ab. *arcuata*; the spot in cell 2 of the hindwings also elongated. June 29th, 1898, at Orsova (Aigner-Abafi).

A combination of abs. *quadripuncta*, Courv., *semiarcuata*, Courv., etc. Combinations of this kind are not infrequent.

ι. ab. *obsoleta*, Tutt, "Brit. Butts.," p. 171 (1896); Gillm., "Ill. Zeits. für Ent., v., p. 52 (1900); Wheeler, "Butts. Switz.," p. 33 (1903). *Subtus-impunctata*, Obth., "Etudes," etc., xx., (p. 18), expl. pl. iii., fig. 27 (1896). *Adonis* ab., Hb., "Eur. Schmett.," pl. cxxvii., figs. 645-6 (*ante* 1816); Curtis, "Br. Ent.," fo. 6 (1824); Stphs,, "Illus. Haust.," i., p. 90, var. ζ (1828); H.-Sch., "Sys. Bearb.," i., p. 121, pl. lii., fig. 248 (1843); Girard, "Ann. Soc. Ent. Fr.," 4th ser., v., pp. 111-114, pl. ii., figs. 4-5 (1865); Fallou, "Bull. Soc. Ent. Fr.," 4th ser., v., p. l. (1865); Mosley, "Nat. Journ.," pl. iii., fig. 25 (1896); Walker, "Ent. Mo. Mag.," xl., p. 189 (1904). *Bellargus* ab., Adkin, "Proc. Sth. Lond. Ent. Soc.," p. 165, pl. i., fig. 1 (1888-9); Dennis, "Proc. Sth. Lond. Ent. Soc.," p. 51 (1892); Sladen, "Ent.," xxx., p. 81 (1897). *Cinnus*, Rühl, "Pal. Gross-Schmett.," p. 276 (1895). *Krodeli*, Gillm., "Ill. Zeits. für Ent.," v., pp. 50-52, pl. i., figs. 3-9 (1900); vii., pp. 337-340 (1902); Wheel., "Butts. of Switz.," p. 33 (1903); Seitz, "Gross-Schm.," i., p. 315 (1909).—The outer transverse (submedian) row of dots on both fore- and hindwings more or less absent —an extreme form of this aberration, with all the spots absent except the discoidals, is very striking (Tutt).

This name *obsoleta*, was created to include all those examples in which the submedian row of spots on both fore- and hindwings were largely absent, including the extreme form in which all are absent; Oberthür, similarly, a few months later, named the obsolete form *subtus-impunctata* (*Etudes*, xx., p. 18, expl. of pl. iii., fig. 27), noting that he "possessed eight examples similar to fig. 27, but more characterised in the direction of loss of spots than the specimen figured, in that the forewings, as well as the hindwings, were entirely without ocellated spots;" he adds that "Engramelle, in 1779, figured (*Pap. Eur.*, pl. xxxix., fig. 82*f*) an aberration of the sky-blue *Argus*, and observed (p. 173) that it had no ocellated spots at all on the four wings, in which it resembles* our fig. 27, whilst Herrich-Schäffer represents an analogous aberration in his fig. 248." This last figure is referred to by Herrich-Schäffer, who notes (*Sys. Bearb.*, i., p. 121) that Hübner's figs. 645-6 represent a rarely-occurring aberration without ocellated spots on the underside, and that he has a similar one in which the marginal spots are almost without red (fig. 248). Hübner's figure (*Eur. Schmett.*, pl. cxxvii., figs. 645-6) here referred to is that of a ♀, the underside of the fore- and hindwings brown, with normal marginal orange lunules, but the submedian and basal spots absent, the discoidals only present in fore- and hindwings. Curtis records (*Brit. Ent.*, fo. 6) a similar aberration, received from Leplastrier (Dover), and Walker (*Ent. Mo. Mag.*, xl., p. 189) notes the same specimen as being now in the "Curtis coll.," at Melbourne, and labelled "*Dorylas*, Hübn. (?)." Adkin records (*Proc. Sth. Lond. Ent. Soc.*, 1888, p. 71 and p. 165) two similar ♂s from Folkestone, the second figured (*op. cit.*, pl. i., fig. 1); Dennis exhibited (*op. cit.*, 1892, p. 51) another similar example, and Sladen records (*Ent.*, xxx., p. 81) yet another, a ♀ taken at Winsley, in May, 1896). Gillmer rightly notes (*Ill. Zeits. für Ent.*, v., p. 52) that "specimens, transitional between the type and the most extreme form of *obsoleta*, are frequent, sometimes with the spots more, sometimes less, expressed, so that," he adds, "it is undesirable to separate them under a distinct name as Tutt has done in *obsoleta*, since the disappearance of the spots is not constant, but varies," etc. This, of course, is just what we did not do, we did not separate them under the name *obsoleta*, but united them under the name *obsoleta*, our description of which included the extreme form (see *suprà*). If, as Gillmer says, it is undesirable to apply a name to the transitional forms, it still leaves the name *obsoleta* free for the well-known extreme form, and the description of *krodeli*, a name created by Gillmer for this extreme form, being included in the diagnosis of *obsoleta*, *krodeli* unfortunately becomes a synonym thereof. As shown by our original description, we particularly noticed "the very striking character of the extreme form of *obsoleta*, in which all the spots are absent except the discoidals," and, if any of the obsoletely marked forms want separating, it appears to be the transitional ones. The wholly obsolete examples, described and figured (*Zeits. für Ent.*, v., pp. 51-52, pl. i., figs. 6-9, 1900(as the type of *krodeli*, came from the Tyrol—Bozen (♂) and Kufstein (♀). Verity notes (*in litt.*) the capture of no fewer than fifteen examples of this aberration in one week in the autumn of 1908, in the pinewoods of the Tuscan coast, with none of the ordinary ocellated spots on the underside of any of the wings. Other obsolete forms are recorded (under the name of *cinnus*) from the Alpes-Maritimes (Bromilow), Eure—Pont de l'Arche (Dupont), Pyrénées-Orientales—Bois del Pinats, le Vernet (Rondou *teste* Oberthür); Girard records (*Ann. Soc. Ent. France*, ser. 4, v., pp. 111-114, pl. ii., figs. 4-5) two examples (1) a ♀ in the coll. Fallou, captured in the Bois de Boulogne, in August, 1864; (2) a ♂ in the coll. Goossens. Fallou notes (*op. cit.*, p. l.) a precisely similar ♂, taken at Montrouge on the fortifications of Paris,

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* This, of course, is not so, as fig. 27 has several ocellated spots. Oberthür names his aberration *impunctata*, speaks of eight examples without any

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ocellated spots on the fore- and hindwings, refers also to the figures of Engramelle and Herrich-Schäffer without any of the dots of the submedian row on fore- and hindwings, and then strangely illustrates the obsolete form, not by an example that is *subtus-impunctata*, but by one that shows a strange combination of impunctate, obsolete and striate conditions, no doubt because of its bizarre aberrational form. All his statements, however, refer to real *impunctata*.

September 19th, 1865. Gillmer specially mentions and figures (*op. cit.*, pl. i., fig. 12) an example captured by Krodel, in Nuremberg, September 17th, 1898, in which, on the forewings, the ocellated spots are wanting, and on the hindwings their disappearance is asymmetrical, the right hindwing possessing on the underside two small basal spots and six small spots in the submedian row, the left hindwing only one small basal spot, and three small spots in the submedian row, evidently a form *antico-obsoleta.* Blachier records (*in litt.*) a ♂ captured at Yvoire, near Geneva, June 3rd, 1886, with no ocellated spots, except the discoidal lunules and one ocellated point on the left forewing, the hindwings brown, with only a triangular white blotch at the end of the cell, although all the wings preserve the marginal lunules. Another ♂, captured at Hermance, May 31st, 1909, is similar, except that on the left forewing are four small ocellated spots.

κ. ab. *cinnus* (non Hübn.), Staud., "Cat.," 2nd ed., p. 12 *in part, viz., diag.* non *refer.* (1871). *Adonis*, Hb., "Eur. Schmett.," pl. cxxxviii., figs. 698-9 (1808-16); H.-Sch., "Sys. Bearb.," i., p. 121 (1843); Bruand, "Lép. Doubs," p. 159 (1845). *Bellargus* ab., Briggs, "Proc. Sth. Lond. Ent. Soc.," p. 77 (1894); Gillm., "Ill. Zeits. für Ent.," v., p. 52, pl. i., fig. 11 (1900). *Adonis* ab., ? Obth., "Etudes," xx., pl. iii., fig. 27 (1890); Mosley, "Nat. Journ.," pl. iii., fig. 24 (1896); Walker, "Ent. Mo. Mag.," xliii., p. 133 (1907). *Cinnides*, Staud., "Cat.," 3rd ed., p. 86 *diag.* non *refer.* (1901); Seitz, "Gross-Schmett.," i., p. 315 (1909).—Alis posterioribus subtus non ocellatis (Staudinger).

This is a form with the usual spots on the forewings normal, on the hindwings absent. This name has been a source of great trouble, for Staudinger, in 1871, strangely followed Keferstein (*Stett. Ent. Ztg.*, xii., p. 308), and referred to *A. thetis* (*bellargus*) (*Cat.*, 2nd ed., p. 12) Hübner's figures of *cinnus* (*Schmett. Eur.*, figs. 830-831), an evident aberration of *A. coridon*, but he did not diagnose Hübner's figs. 830-831, but his figs. 698-699, really representing an aberration of *A. thetis*, to which figures, however, he made no reference. In 1901, he repeats (*Cat.*, 3rd ed., p. 86) the diagnosis of Hübner's figs. 698-699 under the name *cinnides*, but this time erroneously refers to the diagnosis, the figs. 645-646, to which, equally, the diagnosis does not apply, the latter figures having no ocellated spots on the underside of any of the wings. It is quite clear, therefore, from Staudinger's diagnoses, that the form he described as *cinnus* (*Cat.*, 2nd ed., p. 12) was not *cinnus*, Hb., figs. 830-831, and equally so, that the form he described as *cinnides* (*Cat.*, 3rd ed., p. 86) was not *adonis* ab., Hb., figs. 645-646, but that it was a description of Hübner's *adonis*, ab., figs. 698-699, and, since Staudinger's name must follow his diagnosis, and not his erroneous references, we must assume *cinnus*, Staud. = *cinnides*, Staud. = *thetis* (*bellargus*) ab., without ocellated spots on the hindwings, whilst *cinnus*, Hb. = *coridon* ab., without ocellated spots on fore- and hindwings. Herrich-Schäffer refers (*Sys. Bearb.*, i., p. 121) to Hübner's figs. 698-699, and notes that they represent a ♀ without blue on the upperside, without ocellated spots at the base of the forewings, and with the basal spots at the base of the hindwings and those of the curved row absent, except for two tiny white (unocellated) spots. Bruand notes (*Lép. Doubs*, p. 159) a ♂ taken near Besançon, by Gevril, without ocellated spots on the hindwings. Briggs records (*Proc. Sth. Lond. Ent. Soc.*, 1894, p. 77) a ♂, taken at Folkestone, in 1875, with partial submedian row of spots on forewings, but none on hindwings; another specimen being figured by Mosley (*Nat. Journ.*, 1896, pl. iii., fig. 24). Walker notes (*Ent. Mo. Mag.*, xliii., p. 133) that, in the "Dale coll.," are several examples with the ocelli of the hindwings beneath, except the discoidal lunule, obsolete, or nearly so. These, of course, are *cinnus*, Staudinger, but not *cinnus*, Hb. Rowland-Brown captured at Digne a ♀ of this form; the forewings beneath with the basal spots wanting and the spots of the submedian row small, the discoidal spot, however, large; whilst the hindwings have no basal or submedian spots only the discoidal spot. Hall notes (*Proc. Sth. Lond. Ent. Soc.*) a ♂ from Folkestone, with the left hindwing beneath, of the form *cinnus*, Staud., the other wings normally spotted.

λ. ab. *parvipuncta*, n. ab. *Adonis* var. ε, Stphs., "Illus. Haust.," i., p. 90 (1828).—The spots on the underside small.

Small-spotted examples are, in our experience, much rarer than heavily-spotted ones. Reverdin observes (*in litt.*) that he has a ♀, taken near Geneva, in which the submedian spots are very small.

μ. ab. *crassipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., pt. 1, p. 19 (1903). *Bellargus*, Esp., "Schmett. Eur.," pl. lv. (contd. v.), figs. 4, 6 (1778); Bergstr., "Nom.," iii., pl. liii., fig. 6 (1779).—The curved rows of spots, the basal spots and the discoidal lunules, strikingly enlarged on all the wings (Courvoisier).

ν. ab. *albo-ocellata*, n. ab. *Cinnus*, Tutt, "Brit. Butts.," p. 171 (1896). *Cinnides*, Wheeler, "Butts. Switz.," p. 33 (1903).—A form with the spots on the undersides of the wings white, and without dark pupils (Tutt).

In rare cases, the spots of the submedian transverse row are not ocellated, but form small white dots without black centres. This form of aberration appears to be more frequent in the hind- than in the forewings. Hanbury notes (*Ent. Rec.*, iv., p. 19) the capture of an example in Kent, in 1892, combining ab. *antico-obsoleta* and ab. *albo-ocellata*, and describes it as having the underside with only one large spot in the centre of each forewing, whilst the spots on the hindwings are entirely replaced by suffused white patches.

ξ. ab. *nigro-ocellata*, n. ab.—The ordinary ocellated spots on the underside without white margins, only the black kernels being left.

This is a very rare form, found occasionally in examples with the ground colour of the underside exceptionally pale; the marginal spots also are usually more or less obsolete in such specimens.

ο. ab. *addenda*, n. ab. *Bellargus*, Esp., "Schmett. Eur.," pl. lv. (contd. v.), fig. 3 (1778).—The underside presenting additional spots in usually unocellated areas.

Specimens with additional spots in usually unocellated areas, are not at all uncommon in collections, and we have already noted that the striate specimen figured by Oberthür (*Études*, xx., pl. iii., fig. 28) has had its streaks formed by the union of such additional spots into linear form. The most common position for the development of these spots is (1) between the outside of the discoidal and spots 2 and 3 of the submedian series, and (2) between the inside of the discoidal and the basal spots, although other positions are sometimes to be noticed, *e.g.*, rarely under the discoidal between the lower basal and lower submedian spots, not as extensions of these, as in ab. *semiarcuata*, but as small ringed spots of normal appearance, etc. The additional spots are much more frequent on the forewings than on the hindwings, and, as noted above, the most common (but not only) position is between the discoidal and submedian series. Here, pale whitish, interneural lines are frequently to be observed, sometimes merely as lines, at other times with black dots therein, the nucleus of the additional spots, and similar pale streaks, are to be occasionally seen on the basal side of the discoidal; the spots thus formed are rarely exactly the same in number on the two sides, although there is usually an attempt to keep up a semblance of symmetry in position, and such as there are on both sides usually agree in their situation. We have a whole row of examples of *addenda*, captured at Cuxton in different years, in some cases with the spots tending to coalesce almost to the extent of Oberthür's figure (*op. cit.*) on the forewing. In one specimen, on the left forewing, there are 2 additional spots between the second submedian spot and the discoidal, 3 between the third submedian and discoidal, and 1 between the fourth submedian and discoidal, 6 in all, whilst on the right forewing there are 2 between the second submedian spot and the discoidal, and 1 between the third submedian spot and discoidal, and others equally asymmetrical. Blachier notes a ♀ taken on the Salève, June 2nd, 1909, in which the right forewing has 8, and the left forewing 7, supernumerary dots, also a ♂ captured at Versoix, May 21st, 1908, with 5 extra spots on the left forewing, and none on the right. Reverdin also notes (*in litt.*) specimens from the Geneva district with additional spots asymmetrically placed. Alderson captured a ♀ in the Pfynwald in June, 1909, with 7 additional spots on the right forewing and 8 on the left forewing, the upper basal spot also being double in both wings.

π. ab. *impuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24 (1903). *Bellargus*, Esp., "Schmett. Eur.," pl. lv. (contd. v.), fig. 2 (1778). *Adonis* var. δ, Stphs., "Illus. Haust.," i., p. 90 (1828). *Bellargus* ab., H.-Sch., "Sys. Bearb.," i., p. 122 (1843). *Sapphirus*, Stollw., "Lep. Faun. Preuss.-Rhein.," p. 58 (1863); Seitz, "Gross-Schmett.," i., p. 315 (1909); Strand, "Int. Ent. Zeits. Guben," iii., p. 78 (1909). *Cinnus*, Hofm., "Gross-Schmett.," p. 9 (1887). *Bellargoides*, Verity, "Bull. Ent. Soc. Ital.," xxxvi., p. 11 (1904); xxxviii., p. 28 (1906).—With no basal spots on the underside of the forewings (Courvoisier).

This common aberration has recently been referred to *sapphirus*, Meig., which we have shown (*Ent. Rec.*, xxi., p. 202) to be synonymous with *escheri*, Hübn.; neither is it *saphyrus*, H.-Sch., really another form of *thetis*, so that it is impossible to use the older name *sapphirus*, Stollwerck, for this form. We, therefore, use Courvoisier's name.

ρ. ab. *unipuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 24 (1903). *Bellargus*, Esp., "Schmett. Eur.," pl. lv. (contd. v.), fig. 6 (1778).—Only one basal spot on the underside of the forewings (Courvoisier).

ς. ab. *tripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22 (1903).—With three basal spots on the underside of the forewings (Courvoisier).

τ. ab. *quadripuncta*, Courv., "Mitt. Schw. Ent. Gesell.," xi., p. 22 (1903).—With four basal spots on the underside of the forewings (Courvoisier).

There are usually 2 spots between the discoidal lunule and base on the underside of the forewing, one under the other, but the modifications that occur are very numerous. There may be neither of these spots present or either alone, either or both may be double, and either or both may be converted into a short thick line, so that Courvoisier's *unipuncta* may be represented by either the upper or lower spot, his *tripuncta* by a single upper and double lower spot, or *vice versa*, or a dot and bar (*punctistriata*), with the dot either at top or bottom, whilst *quadripuncta* may form two bars (*bistriata*), and so on. Reverdin notes (*in litt.*) of a series of 57 ♂s, Swiss and Savoy specimens, that 6 have only one basal spot, and in all cases the lower is the one lacking, 23 have the 2 normal spots, 22 have a third spot against the upper normal and separate therefrom, in 6 the third is united to it, and forms an interneural streak. In 18 ♀s, 6 have 2, 7 have 1, and 1 has no basal spots, 3 have a third spot, and 2 have the extra spot united to the upper as a streak. In our own British collection, the *unipuncta* generally have the upper spot retained, but in several instances the lower, whilst, strangely, Reverdin does not mention a single double lower spot which is with us quite common.

v. ab. *saphyrus*, H.-Sch., "Sys. Bearb.," vi., supp. i., p. 27 (1852); "Sys. Bearb. Ind. Alph.-Syn.," to vol. i., p. 21 (1855).—*Saphyrus*, Kaden, is a large ♂ of *adonis*, with no black marginal dots on the upperside, but beneath the marginal lunules are rounded off as in *Lycaena corydon*, and are very finely edged with black (Herrich-Schäffer).

Herrich-Schäffer, in the above description, refers to the name as *saphyrus*, Kaden (evidently a MS. name), then in the *Index Alph.-Synonymicus*, to vol. i., he calls it *saphyrus*, Esp. We can discover no *saphyrus*, Esp., and, if Kaden was referring to *sapphirus*, Meigen, in his letter to Herrich-Schäffer, he was evidently wrong in his species, as the latter is *escheri*, Hb., and Herrich-Schäffer says that Kaden's insect was a form of *bellargus* as above described. Gillmer says (*in litt.*) that the *saphyrus*, H.-Sch., is merely a large ♂, without the marginal spots of the *puncta* form, whilst, on the underside of the forewings, the marginal lunules, finely edged with black, are rounded as in *A. corydon*, not acuminate as is usual in *A. thetis* (*bellargus*), whilst all other markings are normal. The aberration appears to have been scarcely worthy of a name.

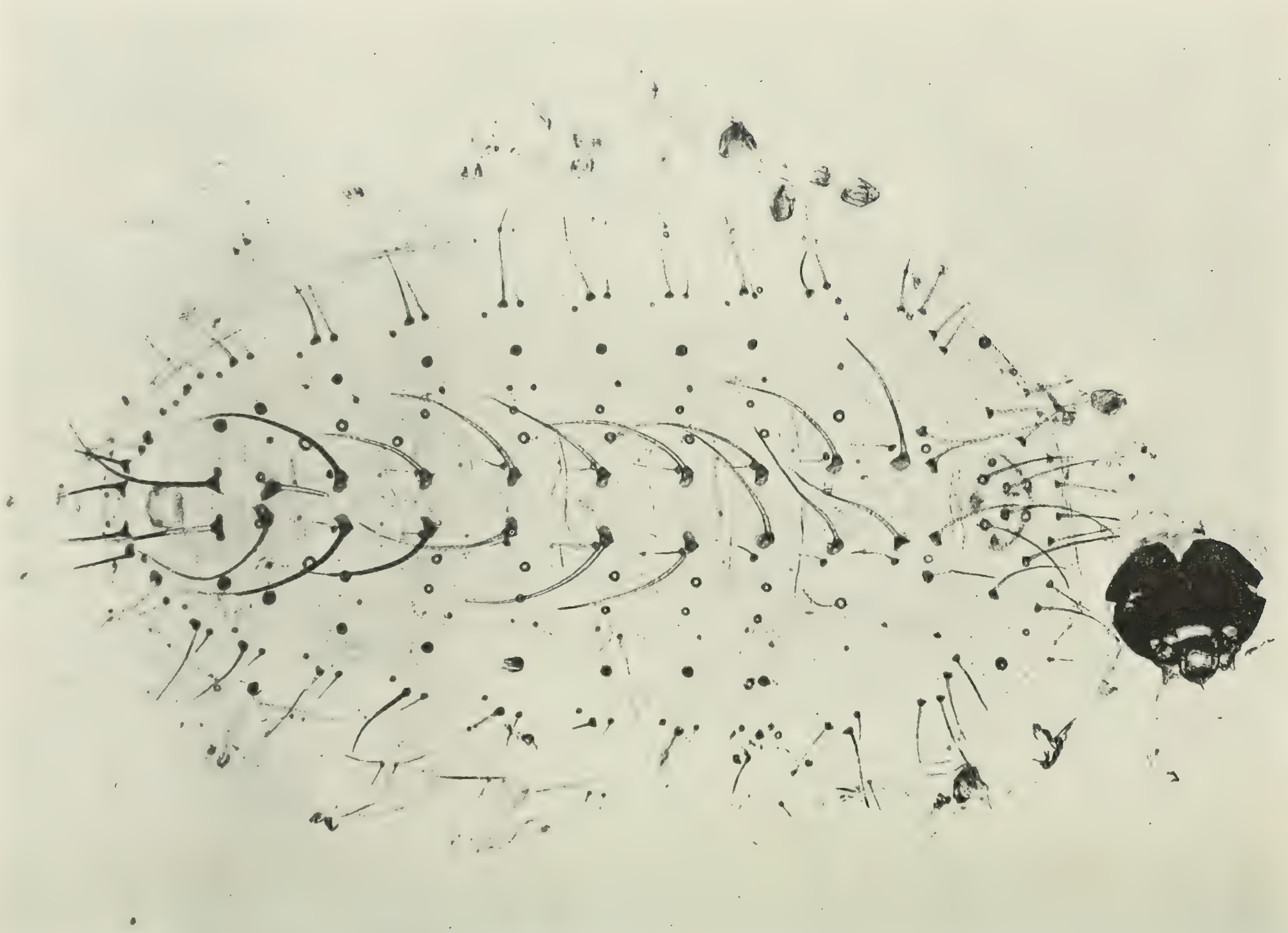
Egglaying.—A ♀ was watched on June 5th, 1893, at Cuxton, laying eggs on the leaves of *Hippocrepis comosa;* her habit seemed to be similar in all cases, fluttering slowly over the herbage and then selecting a plant, laying a single egg on the surface of a leaflet, then crawling a short distance, laying another if a suitable leaflet were found, or if not going to another plant at no great distance. The great resemblance of the egg to a minute speck of chalk, of which there are usually plenty on the leaves, was also noted. Joy notes (*in litt.*) that his observations have led him to suppose that the eggs were laid on the upperside of a leaflet, but Rayward says (*in litt.*) that he has several times found eggs in nature, and, last June, at Lewes, he watched a ♀ ovipositing, and that, in his experience, he has found the egg usually attached to the undersurface of the leaf of the foodplant, but not invariably so, but that he has occasionally found it in other positions and even on a stem of grass growing with the *H. comosa.* Adkin observes (*in litt.*) that, on the morning of September 27th, 1909, near Eastbourne, between 11 a.m. and noon, he watched a ♀, that had been feeding for some time on a knapweed flower, flit away a dozen yards or so up a steep bank, then hover over the herbage, apparently examining it, finally settling down on a small plant of *Hippocrepis comosa* and remain for, perhaps, half-a-minute upon it; she then flew about a yard, again selected a small plant of *Hippocrepis*, on which she settled, and, as he was within a yard of her, he was able to see her protrude her abdomen, bend it under one of the very small leaflets, and, as subsequent search proved, deposit an egg on the underside; again she flitted on, examining the herbage as she went, and ultimately selected another tiny plant of *Hippocrepis*, on which she rested; so intent was she upon her work that the observer was able to get within 18 inches of her, and was thus enabled to distinctly see her abdomen thrust out to its fullest extent, curved slightly under so as to reach the underside of one of the smaller leaflets near the centre of the plant, and observe the working of the terminal segments during the operation of extruding the egg, but was not in such a position as to see the egg actually attached to the leaf; the plant, however, was immediately plucked, when two eggs were found on the underside of one of the leaves at the part where the butterfly had been sitting, one of them evidently having been laid before the observer got into position for observation, a somewhat difficult operation owing to the steepness of the ground, or much more probably by another ♀ that had paid an earlier visit to the same leaf. Chapman observes (*in litt.*) that, in confinement, the species lays freely, usually choosing the undersides of leaves, petioles, and stems, low down near the ground; under such circumstances, the choice being limited, the same spot is often attractive to all the butterflies caged and to the same one on more than one occasion, so that one finds eggs laid, as it were, in patches and other places bare, although, as a matter of fact, the habit of the species is to lay its eggs singly; an egg has been found even on the petal of a flower, but this was quite obviously due to the choice of place being too restricted. Recently we caged up some ♀ s (September, 1909) but only three eggs were laid, one on the upperside of a leaflet (towards the apex), one on the underside of a leaflet, and one on the side of a petiole. Wood observes (*in litt.*) that, in confinement, he found the eggs attached chiefly to the underside of the leaves, a few only on the upperside, and fewer still on stems, in nature all that he has ever found have been laid on the underside of leaves; Wood further notes that he has found difficulty in obtaining eggs in confinement until he has introduced *Lasius flavus*, when the ♀ s have laid readily. This, however, is evidently, from Chapman's experience, not at all necessary. The length of the egg-stage varies according to the time of year, temperature, etc., *e.g.*, eggs laid May 28th, 1896, at Reigate, hatched June 6th = 9 days; eggs laid June 6th, 1899, at Reigate, hatched June 17th = 11 days (Prideaux); eggs laid September 18th, 1909, in London, hatched October 9th = 18 days (Tutt).

Ovum.—The egg is green in colour, with a covering of white sculpturing, that makes it look more or less white, according to whether one sees most of the white accretion or looks in its meshes on the green egg within. The diameter in different eggs and different batches varies from 0·60mm. to 0·65mm. (these differences give a cubic difference of about 7:9), but may be taken to average about 0·61mm.; this measurement is to the outside of the white coating, the actual egg being about 0·54mm.; the height is similarly 0·27mm. or 0·24mm. The egg is of the usual cheese-shape, flat top and bottom, rounded round the margins; in a diameter of 0·58mm., the flat top is 0·46mm. across. On a top view one notes the central micropylar depression, depression because without any of the white accretion; it is about 0·07mm. across, and has a central rosette of 8 to 10 cells, and round this two rows of cells, the outer the larger; this, however, is only broadly so, as the cells are not arranged in exact rows and circles, and, of the outer ones, one or two of the larger seem to belong properly to those covered by white accretion and one or two curved ones seem rather by size and position to belong to the micropylar area, which is consequently merely approximately round, and really of rather irregular outline. The top is very flat, nearly as much so as that of *A. coridon* (rather a larger egg). The true egg is less flat, *i.e.*, the top is more dome-shaped, but, at about 0·20mm. from the centre, the pillars of the white coating appear and, becoming longer, raise the apparent surface and increase the width of the flat top; the central plain has merely a network of white lines, and it is only outside this that the columns at their angles are developed; this top network is angular, the spaces being very irregular in shape but for the most part quadrangular (those in *A. coridon* are more rounded, the lines from angle to angle being somewhat curved instead of straight). This distinction may not hold good of all specimens and races, but it obtains in the specimens under examination. Where the pillars become pronounced (they are highest where the top turns down into the side, but all also well-developed on the sides) the network is in triangles, with a few irregularities, and the columns have six lines hung, as it were, from their summits to the next ones; they are often thick and look as if each line came separately to the top; the side of each cell is about 0·04mm. The green surface of the egg at the bottom of the cells is dotted or pitted very finely (Chapman, June, 1907). The egg presents an almost circular outline about ·6mm. in diameter. It is comparatively shallow, the thickness being somewhat less than half the diameter; the egg appears to be depressed on the upper surface when viewed so that the raised reticulation of the margin is in view. The egg proper is pale green in colour; the surface appears to present two series of oblique lines running in opposite directions, so that it is covered, as it were, with a very well-developed reticulation, fairly regular in some parts, irregular in others. The raised lines that cut each other to form this reticulation are shiny, silvery-white, whilst at each angular point of the reticulation, the cutting lines give rise to a prominent white knob. Almost the whole of the upper surface has the appearance of a flat, shallow basin due to the great prominence of the marginal knobs; in the centre of the upper surface is a minute micropylar depression quite bright green in colour (Tutt, June 2nd, 1898). Other descriptions are those by Hellins (*Larvae Brit. Butts.*, etc., i., p. 107), by Tutt (*Brit. Butts.*, 1896, p. 172). Clark figures the egg (*Ent. Rec.*, xii., pl. xi., fig. 3).

Habits of Larva.—In hatching, the larva eats a hole out of the top of the egg, generally rather to one side, but rarely sufficiently so to avoid destroying the micropylar area. It immediately commences to tunnel into the underside of the leaves of *Hippocrepis comosa*, eating out the inner substance over a small area, leaving the upper skin untouched, thus making a transparent white blotch. Chapman observes that a number of larvæ that hatched between June 20th-24th, 1904, dotted the leaves of *H. comosa* with such white spots, into which they had bored and eaten out the parenchyma (like Coleophorid larvæ) but retired, as soon as they had fed, to the stems close down to the roots, often several inches from their feeding-places, a long journey for such minute larvæ. The larvæ that hatch in June, grow moderately rapidly through July, soon devour a whole leaflet commencing from the side, and are full-fed usually from early to middle August. Chapman notes that about a score of larvæ, from eggs placed on growing plants at the end of June, 1909, were full-fed (at Reigate) by August 15th and brought indoors, and that by the 23rd all those found had pupated. Four other larvæ, from eggs laid at the same time, were taken (July 6th, 1909) to Switzerland and carried about (to Evolène, Arolla, Trelechamp, etc.), and with them a small larva, several days older (brought in on food gathered for the hatched larvæ); this larva pupated a day or two only ahead of those left at Reigate, but the four younger larvæ were, by August 23rd, only about 4mm.-5mm. long; the earliest of these pupated on September 22nd, and three had not pupated by October 3rd, although now apparently well-grown in the last instar. They finally pupated on October 6th, 8th, and 16th respectively. Buckler says that those that batch in September feed exceedingly slowly, stretched out along the midrib of a leaflet on sunny days, and are only 1·5mm. in length in December, continuing to feed, however, so that, in January, they are 2mm. long, make larger blotches in the leaves, and also begin to nibble their edges; by the middle of March they have increased in length and still more markedly in stoutness and, by this time, eat the leaflets from the side, so that, by the end of the month, they are fully 3mm. long, and eat a whole leaflet at a meal; through April, they grow rapidly, especially in warm weather, and eat voraciously, the most forward being full-fed by the end of the month, and the stragglers in May. Chapman says that he has not succeeded in determining the number of larval instars by watching an individual larva, several of which were isolated for the purpose, owing to the close resemblance of the living larva in its successive stages; in several cases a scrap of cast skin was found showing that a moult had taken place, and the rest of the skin had been eaten; in other cases, where no trace of cast skin was found, it was felt to be tolerably certain that a moult had taken place, the larva having been apparently resting with that object, and making a total growth unlikely to occur during one instar; by the bye, a very large proportion of the total growth occurs in the last instar. The third stage appears to be the hybernating one, although larvæ in the second stage are noted as late as November 14th, 1904, whilst others, at the same time, were in the third stage, and, in addition, a larva was noted in early February as apparently only just moulted into third instar, so that one might suppose that the second was the real stage of lethargy, that the hybernation is (as indicated by Buckler) (*suprà*) incomplete, and that the change from the second to the third instar may take place during the occurrence of a few warm days any time very late in the year or in the very early part of the next year. Chapman further notes, however, that he has cast skins of moult from the third to the fourth instar as early as March 5th, and a third instar larva preserved on March 19th, and one of fourth instar of same date, so that there is considerable variation in the dates of reaching and of leaving the 3rd instar. The diameters of the head of the larva at each instar forms the best index and proof of the instar in which any particular larva is—first instar—0·25mm.; second instar—0·36mm.; third instar—0·50mm.; fourth instar—0·74mm.; fifth instar—1·2mm. We note the almost full-grown larva (September 21st, 1909) as being exceedingly sluggish, and, when resting among its foodplant, usually under one or two leaflets, it is somewhat difficult to detect, the ground colour of the body, the yellow markings, etc., comparing very effectively with the sheen of the light on the edge of the leaves, although, of course, the leaves are not even tinged with yellow. When resting, the body is somewhat humped, the thoracic segments being bent over, and the head hardly or not at all exposed, the anterior part of the body in this position wider than the posterior, although, when stretched, and moving slowly; the anterior is the narrower. The conspicuous black spiracles just above the yellow section of the subspiracular flange (the prothoracic as conspicuous as the others), the dense coating of black hairs, the conspicuousness of the black hair-bases, and the dark mediodorsal line (dark green on the meso- and metathorax and 1st abdominal, slaty-blackish beyond to the end of the dorsal groove, and then again dark green to the anus) appear very marked in the larvæ under observation; the projecting green lateral flange, at its most prominent part edged with yellow above (broken slightly at segmental incisions) and continued round the anus and, more faintly, round the prothorax, together with the bright yellow segmental marks on the dorsal ridges of either side from the mesothorax (faint on prothorax) to the 6th abdominal, and the median space widening from the back forwards, are also very characteristic and strongly marked. The larval movements are extremely slow, and, if disturbed, the caterpillar falls to the ground, the head completely retracted within the prothorax and the true legs well under the projecting prothoracic hood; the body is, at this time, slightly curved ventrally at the anal end, and the larva rests, immovably, for a long time on its side or back without any attempt to stir; after a time, however, it just pushes its head level with the front of the prothoracic hood, and moves it slowly from side to side, then throws back the thoracic segments and turns them so that the head and legs face the ground, and so that they are twisted almost at right angles to the rest of the body. It then slowly stretches the head downwards, until the body is quite twisted, and the true legs touch the ground, after which the abdominal segments are turned over, and the prolegs brought to the ground; even then the larva moves forward so slowly that it is almost impossible to detect any muscular movement as it progresses.

Symbiosis of ants and larvæ of Agriades thetis (bellargus).—Of seven full-grown larvæ of *A. thetis* (*bellargus*), found at Folkestone on August 11th and 12th, 1906, two had ants upon them when found, and, in one instance, an ant was observed to be busy stroking the gland with its antennæ in the endeavour to excite the flow of the liquid secreted by that organ, with the desirable qualities of which it was evidently familiar. The ants found attendant upon these were workers of *Lasius niger*, whereas those found on larvæ of *A. coridon* at Reigate, in June, were of a different species, *viz.*, *Lasius flavus*. Efforts to obtain a demonstration of the function of the honey-gland by means of these black ants, some of which were brought with the larvæ from Folkestone, failed, whilst complete success attended the first attempt when an example of *L. flavus*, taken from a nest introduced some time ago into the garden for the purpose of experimenting with larvæ of *Lycaena arion*, was made the medium. Possibly *L. flavus*, which is common on the *bellargus*-affected hill-slopes at Folkestone, is more generally associated with these Lycænid larvæ than are other species of ants, and the instinct for "nursing" more highly-developed in it than is the case with the workers of *Lasius niger*. That ants are not essential to the well-being of the larvæ of this species appears certain, for a

Plate XLIV.



Larval skin of Agriades thetis (bellargus) in first instar × 55.

Photo. F. N. Clark.

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[*To face p. 363.*]

brood reared last year from ova deposited in captivity were kept under conditions which certainly precluded the possibility of their aid (Rayward). Prideaux observes (*in litt.*) that the few larvæ he has found in nature have been unattended by ants. Wood notes (*in litt.*) that he has observed both *Formica rufa* and *Lasius flavus* attending the larvæ in nature.

Larva.—*First instar* (full-grown): About 2mm. in length; with a marked angular outline when seen from the front, the dorsal and lateral flanges carrying long hairs; these hairs are colourless or nearly so, their bases nearly black, and very abundantly clothed with fine spicules, so fine that, without considerable magnification, the hairs appear to be smooth; the seta of i is a long hair, 0·2mm. to 0·33mm. (on 8th abdominal), with a strong curve sweeping backwards, except those on prothorax and front hairs of mesothorax (if these can be called i, they range with them); that on ii is a short (0·07mm.) and nearly straight hair, arising close to and behind the base of i; each segment has three lateral (subspiracular, iv and v ?) hairs, the middle one the longest (about 0·02mm.), the posterior short and of clubbed form (about 0·05mm., much shorter than the similar hair in the larva of *A. coridon* same stage where it is about 0·075mm. long). The hairs corresponding with tubercle iii require special notice—on one side of a particular specimen, this hair exists on the metathorax and on the 1st, 2nd, and 3rd abdominals singly (the anterior of the usual pair), on the 4th abdominal are two, and on the 5th, 6th, and 7th abdominals one, wanting on the 8th abdominal; this anterior hair has an obvious base, but the hair itself, especially in preserved specimens, is very transparent and easily overlooked, it is a very broad, club-shaped, almost balloon-shaped, hair, 0·03mm. long and about half as broad, the second hair on the 4th abdominal is apparently only a base; on the other side of this specimen the second hair (base only) is present on the 1st, 3rd, 4th, 5th, and 6th abdominal segments; in another specimen it is on the 2nd, 3rd, 5th, and 6th abdominal segments on one side, on the other on the 2nd, 3rd, and 4th abdominals; in several cases it carries a hair just a little smaller than the front one. [In the larva of *A. coridon* at this stage, both hairs are much more usually present and the hairs are larger and much more easily observed, the forward hair is nearly as large again as that in *A. thetis* (*bellargus*) and the posterior one at least as large as the anterior one in the latter species.] On the prothorax, the plate is rounded in front, angular behind (a quadrant with the angle rounded); it has, in front, two large lenticles, with a pair of small hairs between them (wanting sometimes), a pair of long hairs near the middle, and another pair, one of which is at about the middle of each latero-posterior margin; the special angular hair seems slightly thickened, spiculated, and comparatively short; there are the usual three hairs along each front margin of the plate, and a fourth in line with them beyond its angle with three in front of the spiracle. The mesothorax has, in front of what look identical with the setæ of i and ii on the following segments, two long hairs with a lenticle between them, the inner long hair looking like i curved forwards; there are four flange-hairs and one at base of legs. On the metathorax and the 1st-7th abdominal segments is a small hair at the margin of the segment in front of i; most of these segments have two short thin marginal hairs (between flange-hairs and prolegs, when present), and the 7th and 8th abdominal segments have a lenticle in place of ii. The anal plate is small and square (about 0·07mm.) without hair or lenticle; seven or eight hairs on either side (three long) belong to the 9th and 10th abdominal segments. The lenticles are, those already noted on prothoracic plate and mesothoracic dorsum, one on metathorax between tubercles ii and iii, corresponding apparently with the upper and larger and anterior of the two that occupy this position on abdominal segments 1, 2, 3, and 4; on 5 they are usually the same but, on one side of one specimen, they are as on the 6th abdominal. The upper front one is wanting in the position it has on other segments, but appears to have retreated to the posterior border of segment; on the 7th and 8th abdominals they are absent, but a lenticle occupies approximately the site of ii, it may represent ii, or that hair may be absent and this may be one of these lenticles; the space between i and the spiracle is reduced in these segments, very much so on the 8th abdominal; the further lenticles are—one in front of the prothoracic spiracle, one accompanying the lateral flange-hairs on the 1st abdominal, and one replacing a marginal hair on the 7th abdominal. The spiracles are amazingly elaborate structures; they present an inner and outer ring, connected together by elaborate columns, the inner ring also with a radiate structure of similar character. Each proleg has the usual two pads, each with a larger and shorter hook; the anal claspers are the same except that the anterior smaller hook is wanting. The general surface is covered with skin-points, which, according to focussing, appear pointed or square. There is no trace of honey-gland or fans. *Second instar:* Barely 2mm. long, thick and stumpy, hardly thicker in front, and both ends rather truncate, as seen from above; seen from the side, the top slopes gradually backwards from the 3rd thoracic to the 6th abdominal, then more rapidly; seen endways from the front, it has a flat top, two slopes, and an under-surface that is not, however, flat, but rises a little on each side to the lateral flanges, the top about half as wide as the slopes are high and with a crest of hairs along either side of the top, quite a haze along the marginal flange, with a row of shorter hairs, halfway up the slope; seen endwise, there seems to be no channel between the dorsal ridges, *i.e.*, the dorsal ridges are merely the rounded angles where the dorsum and slopes meet; seen laterally the segments stand up with a deep sharp groove at the incisions, each being surmounted with a set of black hairs, principally one (i ?) standing erect, with a slight backward curve, a smaller one behind (ii ?), and a still smaller in front; other hairs (those of other side, etc.) support, rather than confuse, these. The colour is a dull dark olive-grey with yellow down the dorsal ridges in little patches, one patch to each segment; the lateral ridge also has a paler, yellowish, more continuous line. [Several weeks ago, when the larva was undoubtedly feeding, its colours were brighter, it was then a dark green, with very distinct yellow lines.] Halfway up the slope, occupying about its middle third, is a darker band, consisting of a patch on each segment, edged obliquely (downward and backward) by paler (yellowish), both above and below. The head is very black and polished; the legs pale. When one tries to get a grasp of the arrangement of hairs and lenticles, one finds that there is a considerable amount of variation between different segments and between even the two sides of one segment, that there is, in fact, already, some assertion of the irregular distribution of hairs, etc., that accompanies their great multiplication in the later stages; the most remarkable instance of this is a lenticle in the median dorsal line, generally to the front of a segment, and a hair, similarly medio-dorsal, towards the posterior margin of the segment. In a specimen taken at random (others would doubtless differ), this lenticle is, on the mesothorax, in the middle of the segment; on the metathorax it is on the anterior margin, as it is also on the remaining segments; on the 6th abdominal it is rather to the right side, on the 2nd to the left of the middle line, on the 3rd much to the right, on the 4th to the left, on the 5th absent, on the 6th to the right, on the 7th much to the left, on the 8th wanting. The median hair is unmistakable; on the 5th and 6th abdominal segments, it is wanting behind; on the 4th it is to the left side (but the other (accessory) dorsal tubercles are arranged in a puzzling way); on the 3rd it is on the left side, on the 1st and 2nd it has become a pair, one on either side; if two (?) posterior tubercles on the meso- and metathorax be the same, then it is wanting on the right side on the meso- and on the left on the metathorax. Similarly, for the lower hairs and lenticles, on going to the next segment to verify exactly the position of a hair or lenticle, one finds it wanting, or distinctly differently situated, and so on. To take the 2nd abdominal segment as fairly typical, we find a large hair with large base, the hair 0·2mm. long, thick, and rapidly tapering, nearly black, and well-spiculated, the base very much wider than the hair, much higher than wide and rather bell-shaped; this is the seta of i; all the other hairs are very similar except that they are very decidedly smaller; tubercle i is rather behind the middle of the segment, ii is behind and outside this, and of about half its length, perhaps, also, a little paler; inside and in front of i is a hair a little larger than ii; it may very well be that the real setæ of i and ii are this hair and the one I have called i; they occupy the more usual positions of i and ii, *i.e.*, my i is behind the middle of the segment and my ii very far back; on the other hand i is much the stronger hair in the first instar. [A comparison with the same stage larva of *A. coridon*, however, shows my i and ii to be both strong hairs, the front one to be clearly the accessory.] Then there are the lenticles and paired hairs on the dorsum already noticed; going down now to the three flange-hairs (iv and v ?), now increased to four or five and not all at one level, we find the spiracle one-fourth of the way up the slope, with no intermediate structure; nearly another one-fourth up and in the line of the spiracle is a large lenticle, below this, a very small one (often wanting); in front of the lenticle is a small hair (iii ?) (this hair is larger on anterior segments), below, and in front of, which is another large lenticle; in this line (slightly sloping up, backwards) at posterior margin of segment, is a short hair; between this and the dorsal set are two hairs (very short) one at each margin of segment; there is also a hair which may be described rather as belonging to the dorsal set in front of and outside i; these last three hairs vary in position in different segments and even as to being present. On the mesothorax (on either side) are four hairs at front and four at hind margin more or less dorsal, then, at a small interval, there are three hairs and a lenticle in front, at the level of the supraspiracular set of the abdominal segments, with six hairs in flange, one above and in front, then three evenly spaced and two more below;

then, on one side or the other, the front dorsal row has only three hairs, but there is a lenticle medially between the two rows. The prothorax has sixteen hairs on each side, below the scutellum and including the marginal set. The thoracic plate is a quadrant with the angle behind, the arc in front; it has a hair at each external angle, and a pair of lenticles on the front margin, the left one of these is accompanied by a second; there is also a lenticle near each hair. The anal plate (in this specimen) carries a single median hair in front and a median lenticle behind it; the other hairs, fourteen altogether, belong to the 9th and 10th abdominals and are all more or less marginal. The spiracles, rather larger than the hair-bases or lenticles, are black raised cylinders with a most remarkable structure of the summit, rather difficult to quite determine; the margin seems to be raised into eight or nine (lighter-tinted) points and there are corresponding hollows, interior to these, one between each two points; the centre is not open but in what precise way it is closed cannot be seen. The lenticles are little circles of dark chitin, the inner margin raised but both inner and outer quite smooth, the centre closed by a membrane with four or five dark spots; this smoothness of the lenticular rings is noteworthy, as, in the larva of *A. coridon*, in which the spiracles are a little less elaborate, the lenticles closely imitate the spiracle in having raised points or knobs along their edges. Below the flange is a lenticle at the front margin of the segment on the 1st and 2nd abdominals, and at the posterior margin on the 5th, 6th, and 7th abdominals; there are four hairs above the legs in a group on the thoracic segments; there are similarly four, sometimes five, on the abdominal segments that seem to belong to tubercle vi. At this level there is, deep in the incision in front of each of the abdominal segments 1 to 7, a curious, nearly black, mark of undetermined nature. There are four minute hairs (vii ?) at base of prolegs. Each proleg has four hooks two to each pad and the anal claspers seem to be the same. The skin-points are very fine and transparent. A specimen preserved on a slide has changed colour, but has brought out in great detail the difference between the darker and lighter hues, the darker being now bright pink; it shows continuous yellow on the flange, dorsal and lateral, also two less conspicuous, *i.e.*, less straight, broad or continuous, series, between these, with further branches more or less breaking up the dark colour; the pink, except quite on the dorsum, is arranged in very beautiful minute reticulations, apparently corresponding with the skin-points; this may be due to the skin-points acting as lenses, but more probably in an actual distribution of pigment corresponding with the dermal cells. *Third instar* (November 18th, 1908): Length 2·6mm.; body very thick and short; colour greenish-olive, with yellow dorsal ridges the colour tending to stretch across the dorsal flat and does so on mesothorax where the dorsal "flat" is widest and the ridges appear to turn round the front border of the segment and meet; it is thickest at metathorax; the "slope" is a little broader than the dorsal flat on the mesothorax, about two and a half times on the 6th abdominal segment; the flat narrowing thus backwards, whilst the slope decreases comparatively little. The yellow of the lateral ridge is narrow. The black spiracles are conspicuous black spots. The hair-bases, etc., though more numerous than in the previous skin, are individually smaller. The spiracles are raised cylinders as high as

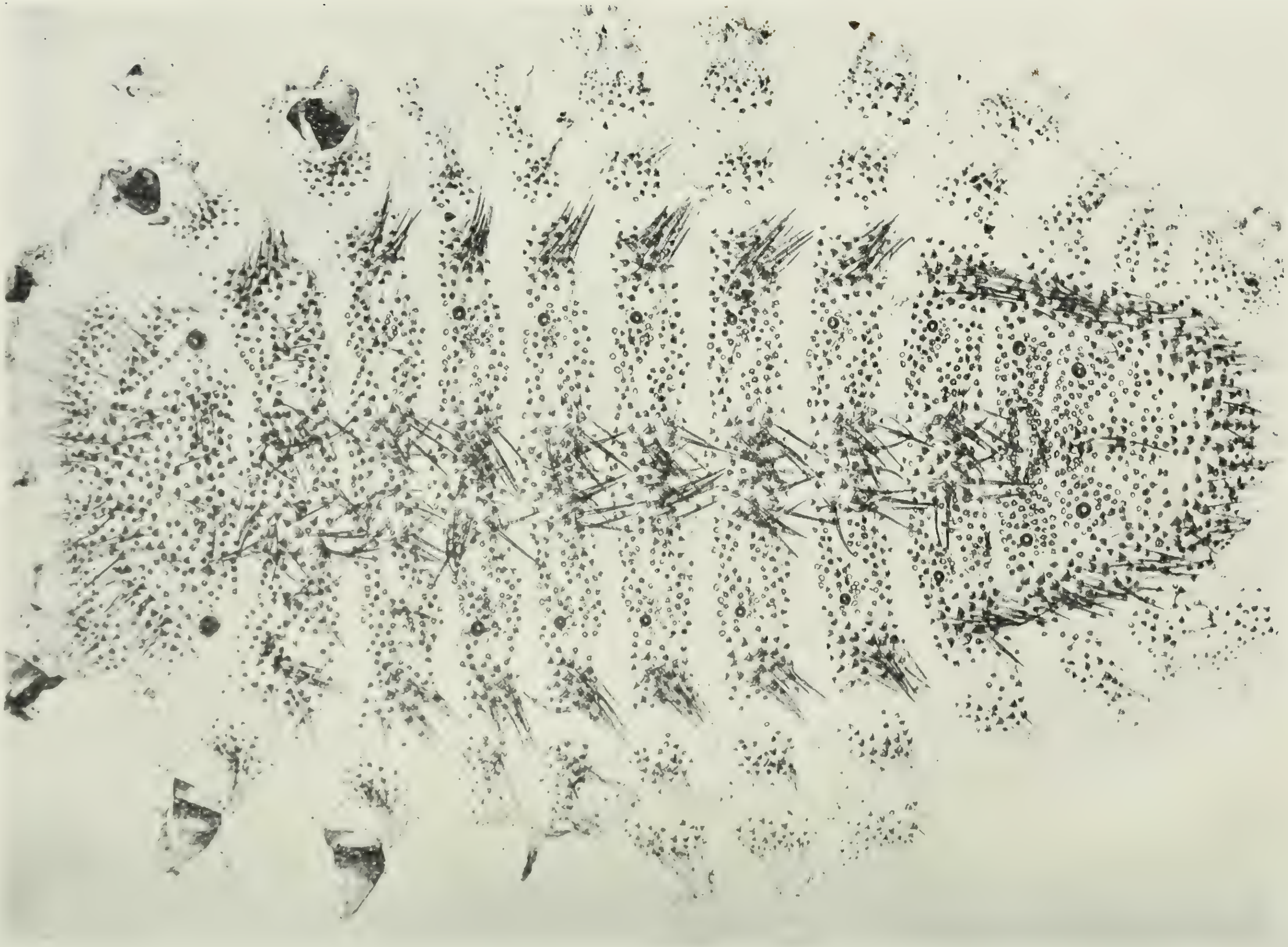

Photo. F. N. Clark.

LARVAL SKIN OF AGRIADES THETIS (BELLARGUS) IN PENULTIMATE INSTAR × 22.

A Natural History of the British Butterflies, etc., 1909.

[*To face p.* 367.]

wide, the special structure of the top less obvious than in the previous instar; the upper surface has, however, a distinctly crenated margin. The lenticles still appear to have perfectly smooth outlines. There are, on each side, nine hairs and lenticles on each segment to each dorsal ridge and twelve between this and each spiracle. The hair of tubercle i is still distinguishable. The incisions are well-marked and each segment rises into a hump on each dorsal ridge. The hair-bases first show the stellate points round their equators, most marked on the posterior hairs, but varying a good deal in different specimens; they are, when fairly developed, six or seven very sharp points, half-way up the hair-base, and of a length equal to about one-tenth of its thickness; the hair-spicules are still numerous, very fine and sharp, but less crowded than in first instar: the abdominal segments show, on each side, three large (0·30mm.) and one short hair amongst which to locate the setæ of i and ii; dorsal to these are one long and one short hair, one or other of which is often absent; between i and ii and the spiracle are four or five short hairs and as many lenticles. The subspiracular or flange-hairs are nine in number, two or three longer, the others vary down to a very short one; the marginal series presents some five hairs and two or three lenticles. The honey-gland and fan-organ are well-developed. Each pad of the prolegs has two or three equal hooks the middle one the largest. *Fourth instar* (two larvæ, March 18th, 1907): The smaller 3·5mm. long, the other 5·0mm., width 1·7mm. The smaller, from the crowding of the dark hairs, looks much deeper in colour than the other; apart from hairs both are of a dark olive-green, with bright yellow flange nearly continuous and dorsal flanges yellow, but in patches, one on the summit of each lateral hump on the 2nd thoracic and 6th abdominal segments, $\frac{1}{3}$ the width of the larva apart on the mesothoracic, $\frac{1}{5}$ or less on the 6th abdominal. The prothoracic plate is in a deep hollow under the overhanging mesothorax. The black spiracles are conspicuous, as well as the glandular patch on the dorsum of the 7th, and the pair of caruncles on the 8th, abdominal segments. The black hairs are also a prominent feature. The larva in this instar shows very definite series of long hairs on the dorsal (setæ of tubercles i and ii) and lateral (setæ of tubercles iv and v) flanges, moderately long hairs on marginal prominence (? setæ of tubercle vi) with many short ones elsewhere, *e.g.*, on the 3rd abdominal segment on the dorsal flange on each side are 3 or 4 hairs about 0·35mm. long, and about a dozen from that down to 0·1mm. long; about 50 (from 0·04mm. to 0·08mm. long) between these and the marginal hairs; the latter have 7 or 8 of a length of 0·25mm. to 0·3mm., and about a dozen smaller, there is a vacancy between these and the marginal group of 2 or 3 of 0·3mm. and 16 or 18 smaller, and again about 20 to 24 at bases of prolegs, the longest about 0·15mm. There are a few rather longer (0·4mm.) hairs on prothorax, those on last segments are not longer but rather thicker. Lenticles are abundant on the "slopes" especially about the spiracles and again about the honey-gland where are a good many special clubbed and curved hairs. The lenticles are usually round but sometimes angular. The hair-bases of the smaller and special hairs are very spiked, but flat and shallow, those of the longer hairs are proportionally much taller, but the spikes are still small thorns, half-way up inconspicuous and often nearly obsolete. The special hair of the angle of the prothoracic plate is very slender, about 0·25mm. long, the hair-base is special as usual, and placed in a dark area with several ordinary, but perhaps slightly specialised, hairs. Each pad of the prolegs has five hooks of varying size but generally two long and three short or three long and two short. *Fifth (final) instar:* 8mm. to 13mm. long and of a rather dark green, with yellow lines, *viz.*, dorsal flange, lateral flange, sublateral flange and bases of prolegs; these lines do not descend into the incisions, and, being more or less subcutaneous and on prominences, look as if the prominences were caused by a little bundle of yellow matter placed under them; the dorsal line is on the flanges of the mesothorax to the 6th abdominal segment; the lateral does not cross the front of the prothorax, but is otherwise continuous, posteriorly, right round; the sublateral row extends from the mesothorax to the 7th abdominal; the 4th series is of course only on the prolegs. The hairs have black bases, and are black above the flange, but many, especially the larger ones, are pale brown below it. The legs black. The head small, black, polished. In this instar the larva is, generally, very like the fourth stage as regards hairs, etc. The head is larger and the hooks of prolegs are seven to nine in number. The hairs are still of very varying character; the dorsal flange-hairs are not longer, but thicker, than in previous instar and the long ones are seven to eight in number; the small hairs of slope are from 80 to 100 in number; there is a splendid variety of very short, clubbed, balloon- and fungus-hairs around the honey-gland and on the dorsum of the 8th abdominal. The spiracles have the appearance of an inner and outer tube or cylinder connected by numerous pillars. The lenticles usually have well-spiculated borders. The spikes or thorns of the long hairs are small but well-developed and sharp. There is a further multiplication of hairs—the dorsal set has 8 to 10 large ones, 0·4mm. to 0·6mm. long; there are about 150 very short hairs on flange, 0·1mm. or less in length; the lateral flange set of hairs have nearly 20 long hairs 0·25mm. to 0·4mm. in length; the marginal and ventral set are also very numerous and there is no vacancy below the flange set. The hairs, especially the long ones, have very much smaller spicules so that they look almost smooth, and some of the long hairs have very little trace of spikes on their bases, whilst the small hairs (on slope, etc.) have much taller bases, with much smaller spikes than before, but much stronger than in the bases of the long hairs. The small hairs on the slopes are generally bent—at nearly a right angle in one specimen, in another they are straight and a little swollen centrally so as to be spindle- or dagger-shaped; this specimen agrees with previous one in the hairs, lenticles, etc., round the honey-gland. The full-grown larva shows the usual double dorsal flange from the 2nd thoracic to the 6th abdominal inclusive, highest near the posterior margin of each segment, giving a serrated outline; viewed laterally, the intermediate mediodorsal area sinks very little between the two flanges. Each segment has, in its flange-prominence, a yellow mark, not reaching the front or back of the segment, yet giving the impression of a continuous line; the prothorax has two corresponding yellow spots in front of the plate. The absence of flange eminences and yellow spots on the 7th abdominal and following segments, making these flat and sloping backwards to a comparatively thin margin, is striking in comparison with the segments in front. The lateral flange has a continuous yellow line, really continuous from

PLATE XLVI.

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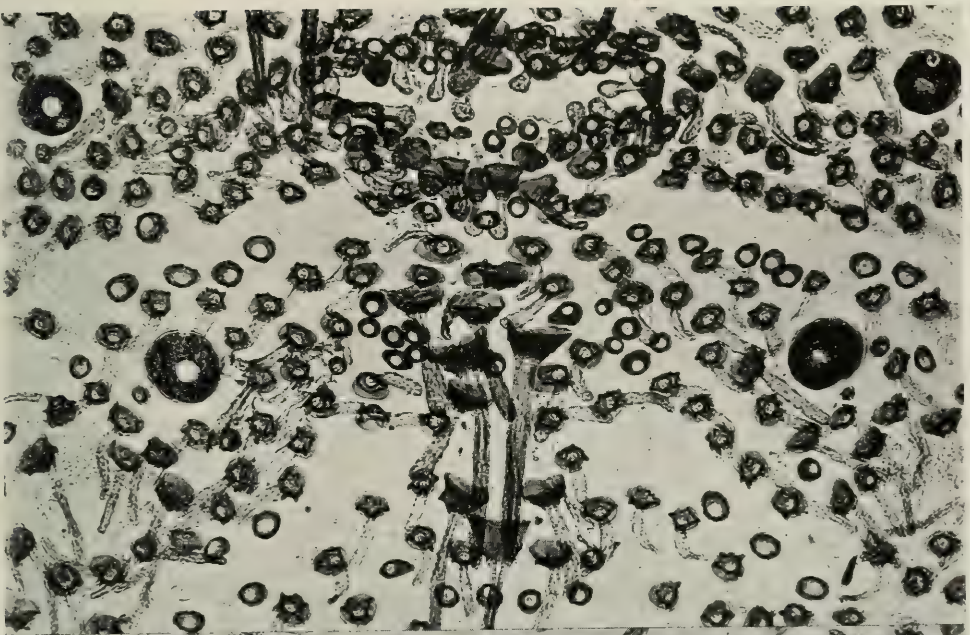

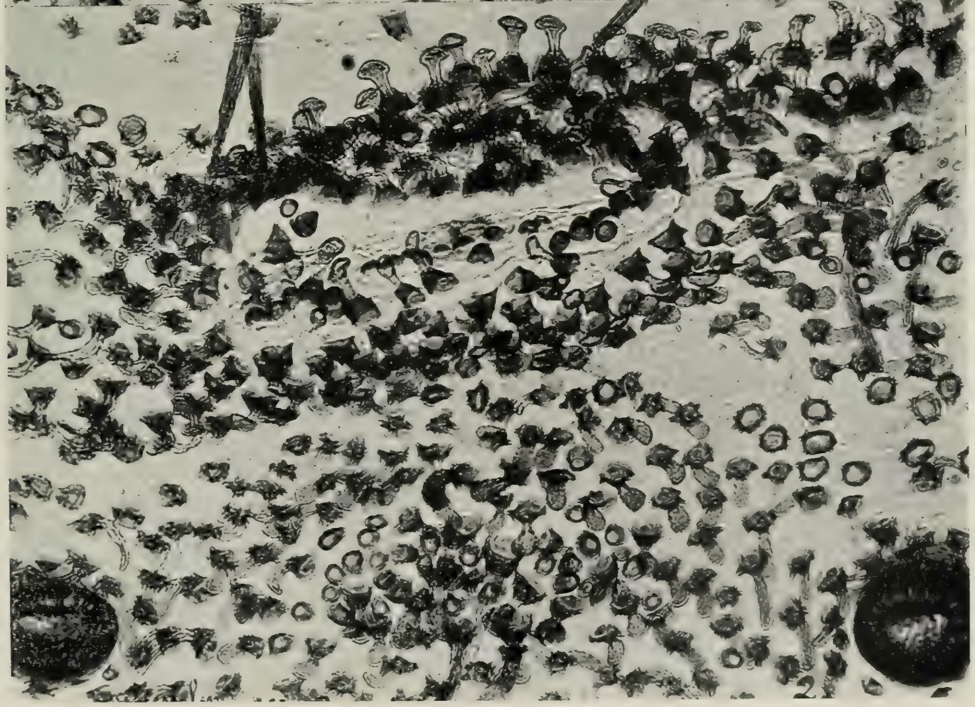

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Photo. F. N. Clark.

Fig. 1.—Dorsal area of 7th and 8th abdominal segments of larva of Agriades thetis (bellargus) in penultimate instar, showing spiracles of both segments, the honey-gland of the 7th, the long hairs of tubercles I and II on the 8th and 9th, and circular areas representing the fans behind the 8th spiracle × 100.

Fig. 2.—Honey-gland area of 8th abdominal segment surrounded by special clubbed hairs, and spiracles of 8th abdominal segment, of larva of Agriades thetis (bellargus) in last instar.

the 3rd abdominal right round the portion of the larva behind this, and continuous round the thin posterior margin of the 10th abdomina segment; in front, the line is not continuous through the incisions, and on the prothorax is represented by two spots—one below and one above and in front of the spiracle, as if this were two segments. Below this, half-way between the lateral flange and prolegs, is a series of yellow spots, apparently on all the segments, but only clearly present on the 2nd and 3rd thoracic, and on the 3rd, 4th, 5th, and 6th abdominal segments. The bases of prolegs have a faint yellow mark. All these yellow marks are some way below the skin and separated from it by green fluid or tissue, recognisable easily by noting the change of position of the yellow marks when looked at from a different angle. The general ground colour is a light apple-green, closely studded with black points, the bases of the hairs. The hairs themselves appear to be pale brown (ochreous, terra-cotta). The spiracles are conspicuous black dots and the black spots at the angles of the prothoracic plate are very obvious. The head is shining black. The true legs ochreous, and rather transparent (Chapman). *Final instar:* About 16mm. long, 6·25mm. wide; the head small and retractile beneath the prothorax, the segmental incisions deeply cut; a double dorsal row of eight humps from mesothorax to 6th abdominal, enclosing a slightly hollow space, broadest on mesothorax, and thence tapering gradually to 6th abdominal; the side spreads out to a rounded ridge running round the body, and hiding the legs from view when the larva is at rest. In colour, the head is very dark brown; the body is deep full green, covered with tiny black specks bearing little black bristles, which are longest on the dorsal humps and subspiracular ridge; on the top of each of the eight pairs of dorsal humps is a deep bright yellow longitudinal dash, somewhat wider behind than in front; these dashes form in effect two yellow stripes interrupted by the deeply-cut segmental incisions; along the rounded edge of the subspiracular ridge is a stripe of bright and very deep yellow going all round, save a slight interruption on the sides of the prothorax, on which are two yellow dots just above the head, and above them again two small black spots; on the mesothorax there is a very faint yellowish dot half-way between the dorsal and subspiracular stripes; just above the prolegs is a row of yellow longitudinal dashes, brightest on the feet-bearing segments (in one example these dashes were curved upwards, and united at the end of each segment to the yellow ridge above). In some specimens the ventral prolegs are also marked with yellow; the spiracles are conspicuous, being round and black; the pulsating dorsal vessel is rather deeper green than the ground-colour (Buckler).

COMPARISON OF THE LARVÆ OF AGRIADES CORIDON AND A. THETIS (BELLARGUS.—The general resemblance between the larvæ of these two species is so great as to render their separation and identification difficult, but there are characters peculiar to each, which, with a little practice, enable one to determine the question with little risk of mistake, at all events in the later stages. The chief points of distinction appear to be as follows:—

1. The ground colour of the larva of *A. coridon* is of a bright clear green, while that of *A. bellargus* is dull, opaque, and almost olive.

2. The yellow wedge-shaped marks on dorsal prominences and sides of the body, are clear bright primrose-yellow in *A. coridon*, clearly defined from the

surrounding ground colour; in *A. bellargus* they are dull, less clearly defined, and along the lateral ridge much more extensive.

3. The hairs and setæ of *A. coridon* are whitish, tinged with a reddish shade; in *A. bellargus* they are reddish at the base, and distinctly black towards the tip.

4. The skin-points in *A. bellargus* are also very conspicuously black, much more so than in *A. coridon*, giving the larva a darker appearance, and this is superficially, perhaps the chief point of distinction between the species.

The larva of *A. bellargus* is full-grown at a time in the spring when that of *A. coridon* is still quite small, so that there is little risk of mistake in the field, should one chance to meet with either. The fact that the two species arrive at maturity at different times, increases the difficulty of defining the characters in which they differ, and it is, of course, a very easy thing to *imagine* differences where one has to trust to memory; the points given, however, have been confirmed by a number of observations, and are probably in the main correct (Rayward).

Foodplants.—*Hippocrepis comosa* (Zeller, Buckler). [Want confirmation—*Genista sagittalis*, bloom only (Ochsenheimer, Nickerl, Richter, Koch, etc.), *Genista* sp. (Krieghoff, Höfner), *Genista* (Möschler, Stange), *Sarothamnus* (Meess and Spuler), *Cytisus* (Höfner), *Trifolium* (Ochsenheimer, Richter, Möschler, Höfner, Meess and Spuler), *Trifolium*, several species (Nickerl), clover species (Schultz), *Lotus* (Höfner), *Coronilla varia* (Wocke, Krieghoff, Höfner, Büttner, Rothke, Meess and Spuler), *Coronilla montana* (Krieghoft). One wonders how much of this is copied by one author from others, and how many of the original records were mere guesses that the larvæ found belonged to this species, and did not. Prideaux notes (*in litt.*) that larvæ, temporarily deprived of *Hippocrepis comosa*, refused *Lotus* and *Trifolium*, which were provided as substitutes; only one larva survived at the end of a fortnight, out of a considerable number, and this eventually produced an undersized ♂.]

Parasites.—*Exorista confinis*, Fall. (*teste* Wainwright). A ♀ of this dipteron emerged September 7th, 1909, from a pupa, the larva of which came out of a larva of *A. thetis* (*bellargus*), August 16th or 17th, 1909, just as it was full-fed. Chapman observes that this larva of *A. thetis* had been raised at Reigate on a growing plant, under a perforated zinc cover, so that how it got stung is not evident, but probably when the larva was resting on the zinc as it might be apt to do at a moult; the nearest habitat of *A. thetis* was a mile distant at least, although *Polyommatus icarus* and *Rumicia phlaeas* occur close by. Wainwright, who identified the specimen, reports it as a rare British species, only two other native examples being known; on the continent it has been recorded from several species of lepidoptera—chiefly "hairstreaks."

Larva in quiescent stage preceding pupation.—The larva of *Agriades thetis* (*bellargus*) laid up for pupation, assumes largely an ochreous tint, the yellow of the dorsal flanges becoming whitish, with a brownish surrounding and sublying region, which seems to be the insect proper, the lateral flange region being translucent, and apparently filled with a faintly bluish transparent fluid between the skin and the body of the insect, the black spiracles are still conspicuous, the prothorax remains greenish or bluish-green (Chapman). The quiescent period of a larva under observation was noted to extend from October 2nd to October 8th, another from October 8th to October 16th, 1909. Two days before the larva actually changes to pupa, one notices that all traces of the yellow dorsal and lateral markings have practically disappeared, the two ridges of the dorsal flange have approached more nearly, the mediodorsal line is dark green, tinged with palish on either side; the transparency of the flanges and the 9th and 10th abdominal segments causes these portions of the body to have a jelly-like appearance, which seems to invest the more opaque, dark, inner structure, roughly now of the shape of the pupa. (Noted October 6th; pupation took place October 8th, 1909) (Tutt).

Pupation.—The larva when full-grown retires to the ground and buries itself just below the surface, amongst the roots of the foodplant, generally selecting a position immediately under a twisted rootstalk. The pupa is sometimes easily found by turning back the leafstems of the plant and exposing the root, without disturbing the latter sufficiently to injure it, the pupa being quite close to the surface. The larva makes no girth, nor is any trace of silk-spinning apparent on pupæ found in nature, but larvæ reared in confinement, and not provided with a suitable place in which to pupate, will spin a few threads of silk on the bottom or side of the cage to serve as a foothold during the pupal change. This is of no assistance in holding the pupa, however, as was demonstrated in an instance where a larva laid up for pupation on the side of a bottle containing the foodplant; there being no earth or suitable retiring place, a few threads of silk were spun on the side of the bottle, and by this means the larva kept its position until the pupal change, when the pupa at once fell to the ground (Rayward). The pupæ of *A. thetis* were found in nature at Dorking, May 11th, 1907, by parting the "mats" of *Hippocrepis comosa*, in dry weather, the pupæ being discovered at the roots of the plants, unattached, but usually in a hollow of the earth, though not completely buried; the pupæ are putty-coloured, the initial greenish tint soon disappearing, and superficially bear a resemblance to the small snail-shells and rubble of chalk-stones found on the surface of the earth (Prideaux). Chapman observes that about a score of pupæ were obtained, in confinement, in August, 1909, at Reigate; in pupating, the larvæ spin a little silk, sometimes hardly appreciable in quantity, generally a slight pad for the larva to rest on, and, in one or two instances, an extra thread or two, suggesting a cocoon; the larva goes as low as convenient to do this, and under something if possible; in some instances the pupa is quite loose, in others the larval skin remains applied to the last segments, but easily drops off; in no case did the cast larval skin retain any hold on the silk; the pupa, therefore, is quite free in any recess the larva may have found. Some larvæ kept in confinement by Buckler, buried themselves, early May, 1874, about ·5in. deep in the loose soil, and formed a weak sort of cocoon; others retired under the stems of their foodplants, and, in angles formed by the branching stems, spun a few weak threads to keep themselves in place, and in these retreats pupation took place. Rayward notes (*in litt.*) that a number of larvæ and pupæ were found on May 6th, 1907, at Dorking. Most of the larvæ were attended by ants, and, in most cases, the pupæ also.

Pupa.—The pupa is very pale light green, with a slight fuscous tone, the wings and other appendages very pale and transparent, as if containing clear fluid and air, as is largely the case, *i.e.*, between the appendages and the body (abdomen), the dorsum a little darker and more solid-looking, but still very delicate and transparent. The pupa is much larger and narrower than those of the Ruralids (Theclids), and the thorax and abdomen are more continuous in form and outline; still it has the Lycænid fulness of abdomen (3rd and 4th abdominal segments), and shortness and roundness of segments beyond wings. Length of pupa 10·5mm. Prothorax narrow and 1mm. from front the width is 2mm. The chief width measurements are as follows:—

1mm. from front of pupa ..	2·0mm. wide ..	Across pro-mesothoracic incision.
2mm. from front of pupa ..	3·4mm. wide ..	Across front wing-spine.
4mm. from front of pupa ..	3·8mm. wide ..	Across thoracic-abdl. incision.
6mm. from front of pupa ..	4·8mm. wide ..	Across 3rd abdominal segment.
8mm. from front of pupa ..	3·8mm. wide ..	Across 4th-5th abdl. incision.
9·5mm. from front of pupa ..	2·0mm. wide ..	Across 6th-7th abdl. incision.
10·5mm. from front of pupa ..	0· mm. wide ..	End of pupa.

On a side view, the waist at the 1st abdominal segment is slight dorsally, but the ventral line is so waved as to make the height here rather less; the ventral line swells out about 2mm. from front, and again at 6mm., rather before the end of the wings; the dorsal line swells over the mesothorax and, after an appreciable dip, again over the abdomen; the highest point is at the 3rd abdominal. The heights are at:—

1mm. from front ..	2·0mm.	6mm. from front ..	4·2mm.
2mm. from front ..	3·5mm.	8mm. from front ..	3·2mm.
4mm. from front ..	3·5mm.	9·5mm. from front ..	2·2mm.

Laid on a flat surface, the front end of the pupa (labrum) would be about 0·4mm. from the surface, the waist-hollow about 0·3mm., and the anal extremity about 1·0mm. The antennæ meet over the maxillæ, about 6mm. from front, and end level with the wings at about 8mm. The surface (except the appendages) is clothed with very short hairs, numerous about the spiracular region (fifteen in the neighbourhood of the 4th abdominal spiracle), sparse elsewhere, about 0·07mm. long, slender, thickening club-fashion to the ends, of a deep red-brown colour. There are numerous minute lenticles round the spiracles, few elsewhere. The general surface has a fine network of faintly brown raised lines, without any indication of the stellate points of the Ruralids (Theclids). There is no trace of a cremastral armature. The antennal ends and the wing-margins adjacent have some very minute brown spots (almost microscopic) that do not interfere with the general appearance of absence of pigmentation; similar spots exist elsewhere on the appendages, wings and thorax. The wings have similar surface-reticulation to the rest of the surface, but it is so faint and colourless that it is difficult to see (in the living pupa). The prothorax is beautifully sculptured; the net-work is very distinct and well-coloured, and, in each little space of the mesh, is placed, centrally, a dark ring or lenticle; this is so in the spiracular region; dorsally there are a good many spaces without lenticles. The prothoracic spiracle-cover is a narrow rounded ridge of purplish colour, sculptured with very numerous fine pits. The labrum is a small triangle, less than 0·2mm. across, below it the mandibles meet in the middle line for nearly an equal distance; below this is a microscopic area not occupied by the maxillæ, perhaps 0·01mm. across, representing the labium. The first legs are very broad against the head, and also very

PLATE XLVII.

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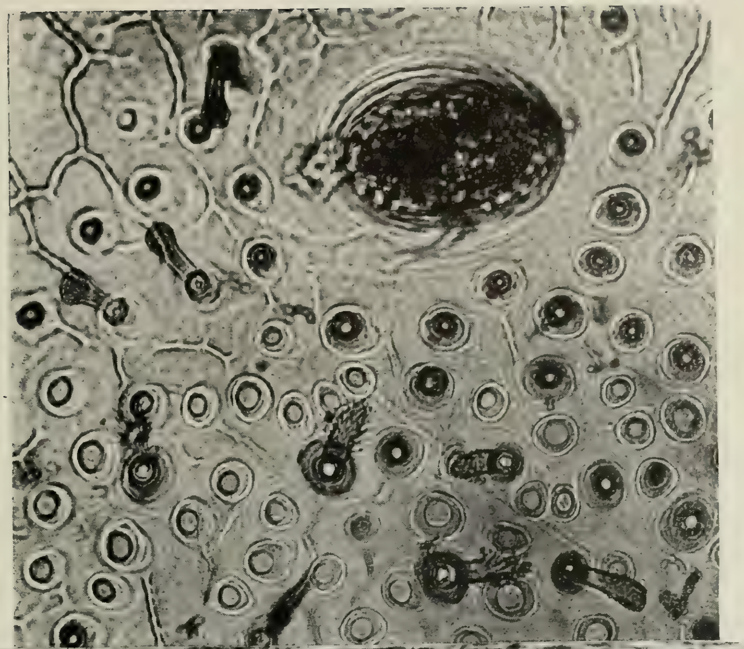

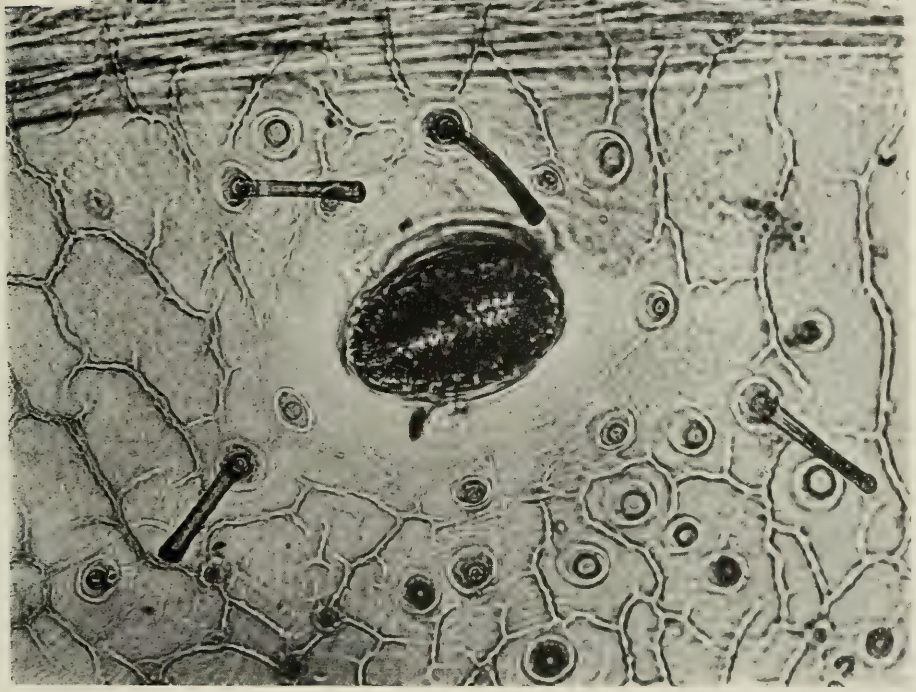

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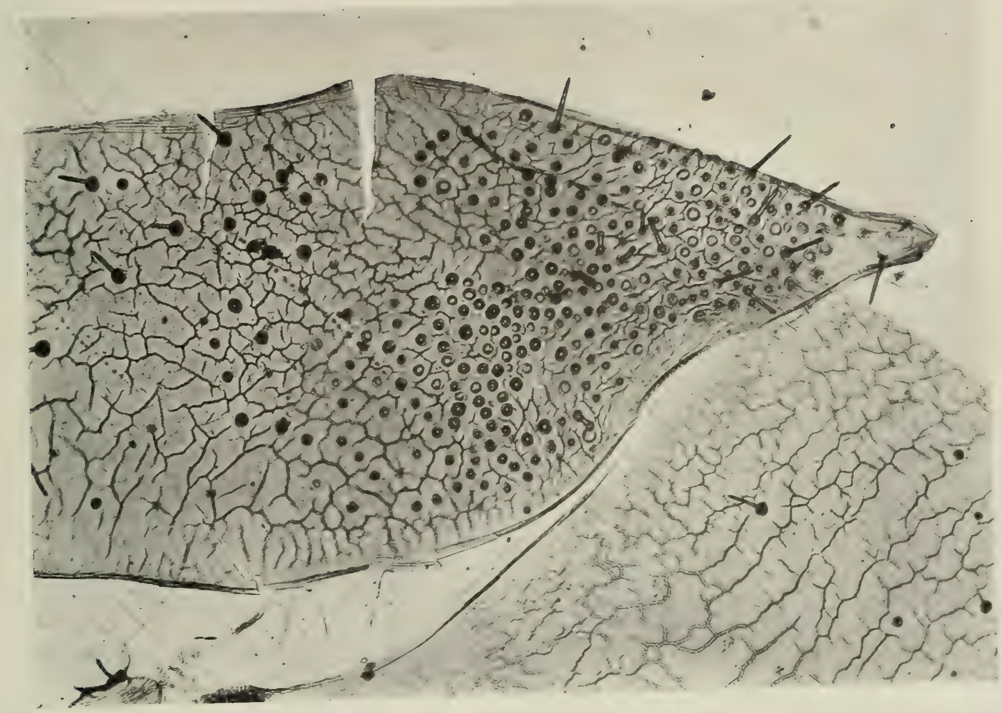
Photo F. N. Clark.

FIG. 1.—REGION OF SIXTH SPIRACLE OF PUPA OF AGRIADES THETIS (BELLARGUS) WITH UNUSUALLY SHORT CLUBBED HAIRS × 150.

FIG. 2.—REGION OF SEVENTH SPIRACLE OF PUPA OF AGRIADES THETIS (BELLARGUS) SHOWING THE MORE USUAL LONGER SMOOTH AND TRUNCATE HAIRS × 150.

thick, bulging, and giving the pupal projection here already noted; they shut out the second leg from the head (as in all Lycænids) but are short. The whole pupa (except appendages) has a sparse coating of very short dark hairs, only visible with a lens, a little more numerous and larger down the dorsum and round the spiracles. The pupa is everywhere fairly rounded (in transverse section); the ventral line is fairly straight; starting from the labrum there is a slight prominence of the first legs about middle, 2mm. from front; then, again, at about the 1st abdominal segment, it bends out (*i.e.*, ventrad), at about 3·5mm. from the front, and continues in the new direction to the end of the wings (8mm.), although rather short of it in one specimen, when it again curves inwards (dorsad) and continues to end (2mm. further). This is in a specimen 10mm. long. A line drawn from the labrum to the 9th abdominal segment would show a prominence about 5mm. long, and with about 0·4mm. of greatest projection, just before the end of the wings. The remaining outline (chiefly dorsal) on side view, consists of the rounded head, very similar dorsally and ventrally, 1mm. long, and 2mm. of vertical diameter, where it meets prothorax there is a slight re-entering angle; the dorsal line rises again to about 3·0mm. from front, to a height of 3·8mm.; it falls again down the back of mesothorax to a marked but not deep waist 4mm. from front, thickness 3·5mm. in the middle of the 1st abdominal segment; thence it continues nearly parallel at first with the ventral line, but, gradually increases its curvature to the end of the pupa, meeting the ventral line at a right angle, the junction, however, being rounded, somewhere on the dorsum of the 10th abdominal segment. Before thickening from the developing imago occurs, the glazed eye is brown and is marked off from the face by a nearly black fine line; the first spiracle is a conspicuously brown short fine line, against the prothorax, which, itself, is conspicuous against the wing-bases by its browner colour and dark hairs; it is in one specimen, not in others, markedly browner than the mesothorax. The abdominal incisions are marked by the segmental margins being raised in slight ribs. The front of the pupa is of ordinary Lycænid pattern. The jaws meet for a short distance, so that the apex of the (slightly darker) labrum is some way from the bases of the maxillæ. In one specimen, a trace of labium appears between (not the maxillæ but) the lower angles of the mandibles. A fairly straight transverse line, 1·5mm. from front, divides the face from bases of maxillæ and the first legs. The maxillæ, except a very slight and short widening quite at the tip, are of uniform width till they disappear (5mm. from front) beneath the antennæ. The second legs reach (in a point) the angle formed by the antennæ crossing the maxillæ, and the first legs also end in a sharp point 3mm. from front (at the incurving of the ventral line); basally they are very large and abut against the antennæ for about 0·6mm. The pupa is comparatively well-supplied with hairs, but they are very short, about 0·1mm. in length, some fractionally larger, some shorter. On the prothorax on either side are about 21 hairs, massed towards the outer angle and front of inner margin; one or two of these are a little shorter and clubbed; lenticles are exceedingly numerous, being packed closely together over much of the outer half of the plate; some of these are of large lumen up to 0·025mm., others small; the smaller they are the more chitinised are their rings, so that it is difficult to say whether some of the smallest are not hair-bases that have lost their hairs by accident, but, in most of them, it is possible to note the dotted diaphragm that marks the lenticles. The lines or meshes of network are fine but very distinct; rosettes are scarce, and consist of minute definite rings, no wider than the lines of the network, with a surrounding area poorly chitinised, about as wide as a large lenticle and with radiated and dotted structure. The cover of the prothoracic spiracle is 0·4mm. long, of the usual columnar structure, the tops of the columns are, however, of various polygonal forms. The line marking off the wing from the mesothorax is more than usually definite, a change taking place in the intensity of the network, the darker thoracic portion ending in a more than usually straight line of the netting, reaching from just outside the spiracle-cover to the notch above the metathorax; there are 17 or 18 hairs chiefly against the dorsal line, a very few lenticles, and a very few rosettes; a variation in the netting suggesting wing-spines occurs at the base of the wings, *viz.*, a forward portion of stronger darker netting, and, behind this, a patch where it is evanescent, and, over this area, an extremely minute dotting of the tissue fills the meshes (the pupal skin apart from net-work, etc.) much more plainly than usual. The metathorax has 3 to 6 hairs, 7 or 8 large lenticles, and 15 to 20 small ones; the angle forming the portion of the hindwing is marked off by a band in which the network is hardly visible. The 1st abdominal segment has no hairs, very few lenticles and very weak netting. The 2nd has 15 or 16 dorsal hairs and about a dozen near each spiracle, where is also a flight of 100 or so of various-sized lenticles. The following segments are much the same, the hairs rather more numerous round the spiracles, and, on the 6th abdominal, with some balloon- or clubbed-hairs. Rosettes are rare except along a region a little way below the spiracles. There is a special structure to be observed some little way above the spiracles, an area from network lines, which, as they gradually appear round it, radiate from it. Then, close above this, and apparently belonging to it, is a bit of tissue attached to a point, at first glance looking just like a hair, but, really, it is something drawn out on moulting (like the tracheal linings are), as noted in other Lycænid pupæ. The whole of this structure suggests that it follows on (*i.e.*, is identical with) the "upholstered" hollow that the larva possesses just here. On the dorsum of the 7th abdominal is a marked transverse line of scar, structureless, *i.e.*, without network and surroundings, evidently the trace of the honey-gland. [In some pupæ of the allied *Agriades coridon*, this is a very conspicuous feature to the naked eye.] In the cremastral region, fine skin-granulation is conspicuous; there is no network, and a number of points, not unlike small lenticles, are probably really obsolete cremastral hooks, which are homologous with rosettes (not with hairs or lenticles); dorsally on the 9th abdominal segment are a few genuine lenticles; cremastrally are about a score of ordinary hairs. The head-piece has about 30 hairs; the eye [inside (or rather outside) glazed eye] 3 or 4. The two mandibles meet for about 0·2mm. beneath the small triangular labrum; the chitinised portion of labium is very minute, and diamond-shaped (exposed portion probably about 0·04mm.). The maxillæ proceed for about 4mm., and then are covered by the antennæ; they proceed for about 3mm. beneath antennæ, and for 0·5mm. in the special pocket between the 4th and 5th abdominal segments. In the



1.—Prothoracic plate (one side) of pupa of Agriades thetis (bellargus), showing pointed, truncate, and clubbed hairs, a few skin reticulations, and abundant lenticles × 40.

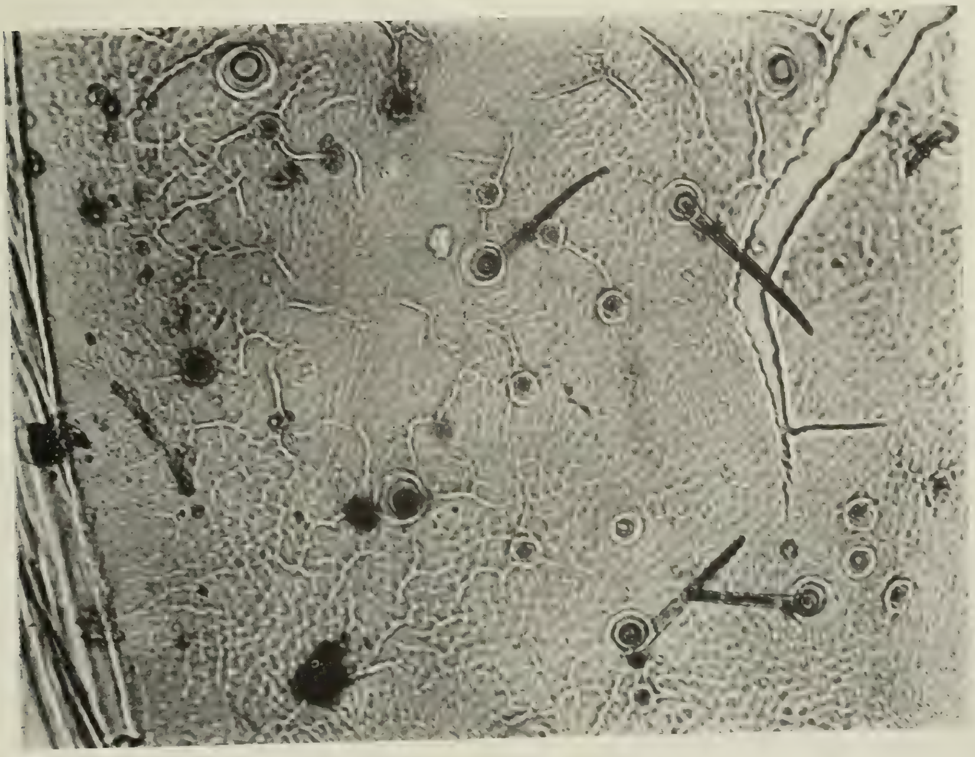


Photo. F. N. Clark.

2.—Portion of cremastral area of pupa of Agriades thetis (bellargus), showing absence of hooks, presence of skin-point rosettes (homologous with hooks), and ordinary hairs × 150.

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species we are describing, this pocket is usually everted in the disturbance of emergence, or in mounting the pupa afterwards, so that, being internal, it is not easily discoverable in the unmounted pupa, and is apt to be so displaced as to escape detection in the mounted one; some other pupæ, however, such as that of *Plebeius argus* (*aegon*), in which it has a more solid structure, enable one to trace it here and elsewhere. Until this is grasped, the small, semi-chitinised end of the maxillæ is puzzling. The 1st legs have a region with lenticles, with a hair or two about 1·3mm. from top, and again an odd one about 1mm. lower (*i.e.*, 1mm. from where it disappears); basal to the lenticular region, the network on this leg has alternate bands of rather square and of elongated cells. The 2nd leg carries several lenticles close to its lower end; it also shows some indications of the general arrangement of netting. The antennæ are narrowed where they pass the side of the head, and the basal enlargement is small; they widen just where the maxillæ go under them (a good way short of the club) and then narrow again; the network runs into a rather transverse arrangement at intervals (joints of antenna?) (Chapman). The pupa is about 12mm. in length, dumpy in figure, the profile of the back swelling out at the thorax and dropping again at the waist, the abdomen sloping off in a curve to the rounded anal end; the ventral profile much straighter, though still with a slight curve; the wing-cases reach more than two-thirds of the whole length, and the widest part is just where they end. The thorax and wing-cases are slightly glossy, the abdomen granulated; some very small hairs scattered all over surface; the colour at first greenish on the wing-cases, greenish-brown on the rest of body; afterwards ochreous all over, finally turning very dark the day before the imago emerges (Buckler).

Sex of pupæ.—The determination of the sex in the pupal stage appears to be somewhat difficult, or, indeed, impossible. Chapman reports that, of 20 pupæ examined, 8 were supposed to be ♂s, 6 ♀s, and 6 others doubtful, judged by form and size; these produced respectively 4 ♂s and 4 ♀s, 2 ♂s and 4 ♀s, 3 ♂s and 3 ♀s. A careful examination of the pupæ, proved by breeding to be respectively ♂ and ♀, shows no differentiation of end segments, owing to the incurving ventrally. In both sexes the 8th abdominal segment is just evanescent ventrally, the 7th and 9th (or 10th) abdominals meeting here, and the two sides of the 8th abdominal ending in a point on either side; the 9th and 10th abdominals appear to be fused, unless the 9th abdominal is entirely hidden; a slight duplication of the incision at either side, does not settle the point, but is the only indication that here are two segments instead of one.

Colour-change of pupa of Agriades thetis.—A pupa, apparently just changed (9 a.m., October 8th, 1909) is of a translucent pale green colour; the anal end withdrawn entirely from cast skin, so that there are no attachments whatever. About 11 a.m., the wings appear to be rather darker green towards base, paler towards outer margin, the prothorax and frons very pale green, the rest of the body already much greyer, a darker mediodorsal line from mesothorax to anus. October 15th (pupa now a week old): The meso- and metathorax green, wings pale green, the base rather fuller coloured, as if body of meso- and metathorax was showing through; also more definitely green marginally (*i.e.*, against "Poulton's line"), the central area of wing almost colourless, and somewhat opalescent; the appendages also green; more deeply coloured over meso- and metathoracic segments; the prothorax pale greenish-grey tinged very slightly with reddish, the glazed eye conspicuous, exhibiting a narrow blackish lunule; the abdomen greenish ventrally, slightly tinged with red, the dorsum greenish with reddish mediodorsal line broken somewhat at segmental incisions, and with reddish shades along the spiracular and supraspiracular lines, and again between the latter and the mediodorsal on abdominal segments 1-8; the abdominal segments 9 and 10 reddish-grey; the abdominal spiracles (2-8) flesh-coloured and conspicuous. October 28th: The whole of the wings now opaque and of a creamy tint. November 2nd: The wings are now very opaque, and solid-looking, still creamy in colour; the head and prothorax light brown, the eyes darker; the rest of the body still strongly tinged with green, especially the prothorax. November 9th: The pupa browned considerably; the eyes blackening; the thorax and abdomen brown; the head, appendages and legs also still brown; the antennæ rather brighter brown; the forewings of a delicate brown with pale pea-green base, nervures, and outer and inner margins; the neuration (of the as-yet little-developed imago) standing out very distinctly, in its entirety, all the nervures being conspicuously marked as green lines. November 11th: The meso- and metathorax blackish dorsally; the 1st and 2nd abdominal segments darkened considerably, also dorsally; the eyes also blackish; the rest of the pupa brownish-fuscous, except the wings, which are brown or fawn, and still with bright green nervures and outer margin. November 12th (10.30 a.m.): The dorsum, except the prothorax, blackish-brown, the meso- and metathorax almost black; the raised posterior edges of the abdominal segments browner and shiny; the prothorax and venter dark brown, the antennæ with conspicuous, black, intersegmental lines, the eyes conspicuous; the ground of the forewings, with the fawn-colour of yesterday covered with a soft green floss (? hair-scales), thickest along the edges of the still bright-green nervures; the outer margin forming, as it were, a bright pea-green fringe, through which a dark linear space passes at the end of each nervure, and in line with the position in which the black dashes occur in the chequered fringes; the basal wing-spine prominent and dark brown in colour, but the green at the base of the wing abutting on it is already taking on a clear metallic indigo-blue tint, and the scaling here has lost the flossy appearance it yet has on the other parts of the wing, and has become opaque so that none of the ground is discernible. 2.30 p.m.: The outer margin of the wing that looked fringe-like at 10.30 a.m. is now seen to be the outer portion of the wing; it is of a distinct metallic green with an indigo tinge, edged by a strongly-developed black outer-marginal line (♂); the outer portions of the nervures in this metallic area are now also black (described this morning as looking like linear spaces); the true fringe on the sloping outer area of the pupal wing, beyond "Poulton's line," being as it were puckered together almost to a point on the outer margin of the fringe, the black dashes in the fringe, each starting from the terminus of a nervure, approaching each other as the fringe reaches the apex of this puckered area, the four dashes coming from the branches of the median nervure being particularly conspicuous; the discal area of the wing paler than the margins, and very faintly tinged with indigo. 3.30 p.m.: The wings all over of a deep indigo, except the disc, which is still paler; the nervures pale and shiny over base and disc to the outer area, black in the outer portion of the wing, and continued into the fringes; the dorsum now quite blackish, the meso- and metathorax quite shiny black; the limbs and abdominal segments dark fuscous. 4.0 p.m.: Wing now deep indigo-blue all over (with slightest greenish tint), wings apparently puckered transversely, as if pupa-case is too small—one distinct pucker at base, another across disc, another along outer area, another at apex, black marginal line now looks very fine, the fringes paler than heretofore. November 15th (Pupa has been in cold room without fire for two days): Wings very deep, uniform indigo-blue, with a saturated appearance. November 16th: Wings of a brilliant peacock-green when seen in a full light; a pale-looking air-space over middle of wing. November 17th (9 a.m.): The wings as yesterday morning; the abdominal incisions somewhat extended. 10.30 a.m.: The imago emerged, and after a little help, owing to apex of one forewing being held by pupal skin, it expanded into a well-developed, though small, specimen (Tutt). [Dr. Chapman's account (*infrà*) deals fully with the final changes.] When newly-changed (and for a few days afterwards) the head, appendages, and wings are quite transparent, and seem filled with a pale yellowish-ochreous fluid. They do not become darker or more solid as a matter of pupal maturation, but, as the imago within develops, they become whitish and opaque, the eyes becoming brown. The rest of the pupa is darker, and, though very delicate, looks more solid; it is greenish (in one specimen the thorax is ochreous) with darker brownish dorsal and lateral lines on the abdomen, and, in one specimen, with a brownish shade representing oblique lines. As the emergence approaches, the wings lose their liquid, transparent appearance, and gradually become dense and of a creamy tint, with darkening of the eye-spots, and some darkening of the thoracic region dorsally. The margin beyond "Poulton's line" is of a slightly different tint from that within it, so that it becomes very obvious. Darkening continues till, at length, the whole pupa is almost black, and the colour of the wings is evident enough to distinguish ♂s from ♀s. One curious circumstance is that the dark marks on the fringes are very obvious, but, instead of being radial from the wing-margin, they radiate from the point, about midway along the hind-margin of the wing, where it crosses the 4th-5th abdominal incision, passing from the 5th to the 4th abdominal, and looking as if the hind-margins were puckered together. The antennæ are also very evident within the transparent antenna-cases, and their tips are seen to be nearly 1mm. from the ends of the cases, the terminal portion of the latter being to this extent vacant. Some few hours before emergence, the incisions between the 2nd and 7th abdominal segments are extended, showing as whitish lines; those incisions that are free ventrally, *viz.*, 4th-5th, 5th-6th, and (less) 6th-7th, are more marked than those behind the wings 2nd-3rd, 3rd-4th. It is to be noted that the pupa, after getting very dark, but showing something of blue in ♂, and fringes white, becomes paler by the stretching of the abdominal segments and opening of the incisions, which look whitish. This change occurs some time within the 24 hours preceding emergence; if it take place early in the morning, the imago will probably not appear till the following morning, but it will equally do so, if the change occurs in the afternoon (Chapman).

Times of appearance.—The species appears to be, throughout the whole area of its distribution, largely, if not entirely, double-brooded. In all cases where eggs have been laid in confinement in England, in May-June, the resulting larvæ have produced autumnal imagines, but, in some years, *e.g.*, 1888, etc., the later brood has been practically absent, and it is possible that the species, in such years, produces only a very partial second-brood. On the other hand, in favourable years, the second brood may be, and often is, even more abundant than the first brood. In average years the first brood is on the wing from the end of May until early July, and the second brood from the middle of August till the end of September, but, in early years, *e.g.*, 1893, the species has been out before the end of April, and the first brood over before the end of May, whilst the second brood has appeared in mid-July and been exhausted before the end of August in the south-east of England; on the other hand, in late years, as in 1903, 1907, and 1908, the first brood has continued until mid-July, whilst the late brood, except for single specimens, has not appeared until early September, but has then continued until mid-October; in the cold wet year of 1888, the scanty first brood occurred in late June and early July, whilst no second brood was seen at all in its usual haunts in Kent, Sussex, etc. In 1898, the first brood, with a very late spring, and that of 1905 with a cold early summer, were exceptionally late, but the second broods well up-to-date owing to the improved midsummer conditions. The following tabulation by Dr. Hodgson, compared with our other entries for these years (see *posteà*) may prove interesting:—

YEAR	PERIOD OF 1ST BROOD	IN WEEKS	INTERIM	PERIOD OF 2ND BROOD	IN WEEKS
1903	June 2nd (well out)-July 8th	5	6 weeks	August 22nd-Oct. 9th..	7
1904	June 6th-July 4th ..	4	6 weeks	August 20th-Sept. 25th	5
1905	May 27th-July 28th ..	9	2 weeks	August 12th-Sept. 27th	7
1906	May 29th-July 7th ..	6	4 weeks	August 8th-Sept. 23rd	7
1907	May 27th-July 23rd ..	8	4 weeks	August 24th-Oct. 13th	7
1908	June 4th (very rare)-July ?	?5	?7 weeks	August 29th-Oct. 2nd..	5

The times of appearance are almost exactly similar in the lowlands of central Europe. In Belgium the species is always double-brooded, the first brood appearing about May 20th, the second in August, and lasting until the end of September (Lambillion). In western France, it also occurs twice in the year, first in May and June, and then in August and September (Oberthür), April-May and August in the Basses-Alpes (Tutt), May and then August, in the Alpes-Maritimes (Tutt), April-May and June-July, in the Bouches-du-Rhône (Siépi), May-June and July-September, in Eure (Dupont), May and September, in Gironde (Trimoulet), May and July-August, in Loir-et-Cher (Chevillon), May-June and August, in Maine-et-Loire (Delahaye), also in Puy-de-Dôme (Guillemot), etc. In Switzerland, in the lowlands, it also occurs in two broods, the first in May, and a more numerous one in July-August, becoming, however, gradually single-brooded in the mountains (Frey); one supposes this to be generally true, although our detailed lists give many dates in April for the first brood in the lowlands, which appears to last from April-June in different seasons; one suspects that it is impossible for a second-brood to occur at high elevations in the central Alps, so many localities in which are recorded in our distribution lists. In Italy, it is double-brooded throughout, occurring in May-June and again from July to September in Tuscany (Verity); May and in August-September in Lombardy (Turati); June (Rowland-Brown) and again in August at Susa (Tutt); June, and again in August at Certosa di Pesio, in Piedmont (Norris). In Portugal it is certainly double-brooded, the early brood being over in May at Alferce (Eaton), occurring in May at Portas de Rodão, and June in the Sétubal district (d'Azevedo), although we have no records of the later brood. In Spain, it occurs abundantly in two broods in Asturias, in May-June and September-October (Seebold), in Albarracin (Korb), and in the Teruel district (Cunì-y-Martorell), April-May and July, at San Roque (Walker), whilst, in its extreme southern locality, in Algeria, it occurs in May and again in September and October (Oberthür). In Germany, even in its most northerly localities, it is double-brooded, occurring in East and West Prussia, Thuringia, Province of Saxony, Bavaria, Baden, in May and June, and again in August; in Brandenburg in May-June and July-August; in the Rhine Provinces, in May-June and August-September; in Hesse, in May-June and end of July-August; in Waldeck, end of May-early July and early August-end of September (and occasionally beginning of October); in Silesia, mid-May-June and end of July-September, etc. In Austria it is similarly double-brooded, *e.g.*, in Bohemia and Croatia in May-June and July-September; in Moravia and Carinthia, in May-June and July-October; in Lower Austria, in May-June and August-September; in Salzburg, May-June and August-October; in Tirol, in May and July-August; in June and again in August in Galicia (Nowicki). In Bulgaria, in May-June and July-October; in June and August-October, in Roumania (Fleck). In its more eastern localities, *e.g.*, Asia Minor, it occurs in early April-May, and again in July and August, but, in the mountains, the first brood is often delayed till June, although Bethune-Baker gives May and July for the Taurus mountains. The following are the actual dates we have noted —in Britain—July 18th, 1833, just appearing at Dover (Stephens); September 13th, 1845, on the downs near Godstone Road (Stainton); September 22nd, 1855, at Hollingbury Coombe; June 25th, 30th, August 16th, 1856, at Hollingbury Coombe (Image); May 17th, 1857, on Westwell Downs, near Ashford (Russell); June 1st, 1857, on the "Denbies," near Dorking (Trimen); August, 1857, near Reigate (Tugwell); August 16th, 1857, near Carisbrooke Castle (James); June 7th, 1858, at Hollingbury Hollow (Knaggs); June 15th-22nd, 1858, at Folkestone (Drury); August 3rd-September 17th, 1858, at Ashford (Russell); August 15th, 1858, near Croydon (Gregory); September 4th, 1858, near Deal (Harding); June 8th, 1859, near Croydon (Rogers); June 13th, 1859, near Deal (Harding); August 15th-16th, 1859, at Lulworth (Green); August 23rd-24th, 1859, in the Isle of Wight (Fereday); August 24th-September 1st, 1861, at Torquay (Stewart); August 10th, 1865, at Hollingbury Coombe (Image); August 16th-30th, 1865, between Dover and Sandgate (Cox); throughout June, 1867, in the Isle of Wight (Ingram); June 5th-26th, 1869, in the Isle of Wight (Cooper); July 2nd and 3rd, 1869, at Folkestone

(Vaughan); August 21st, 1869, at Hollingbury Coombe (Image); June 4th, August 28th-September 6th, 1870, at Caterham (West); June 24th, 1872, first example at Painswick (Watkins); August 30th, 1873, at Folkestone (Jones); May 29th-June 4th, 1876, at Eastbourne (A. H. Clarke); June 15th, 1876, on the downs near Abbott's Wood (Dale); August 1876, common on the downs near Abbott's Wood (Dale); August 29th, 1876, in poor condition at Freshwater (Bower); October 4th, 1877, at Wotton-under-Edge (Perkins); first brood still out in fine condition, July 19th, 1879, at Castle Hill, Folkestone (Wellman); just coming out at Folkestone at the end of September 1879, only six being seen before September 22nd, twenty on October 6th (Goss); June 20th-30th, 1882, at Eastbourne (Wright); September 16th-23rd, 1882, at Folkestone (Hall); June 10th-21st, 1884, in the Isle of Purbeck (Bankes); June 23rd, 1885, near Beachy Head (Hawes); May 20th, 1886, at Torquay (Terry); May 23rd, 1887, in the Isle of Purbeck (Bankes); just appearing, June 4th, 1887, at Ventnor (South); just appearing, June 6th, 1887, near Chatham (Sabine); June 22nd, 1887, well out, at Cuxton, a late spring (Tutt); August 8th, 1887, near Chatham, hot summer (Sabine); August 19th, 1887, ♂s just emerged, September 3rd, 1887, both sexes common at Cuxton (Tutt); first seen August 28th-September 16th, 1887, near Eastbourne (Adkin); June, 1889, on White-Horse Hill (Wheeler); June 22nd, 1889, at Horsley (Turner); June 6th, 1890, in Queendown Warren, June 15th, 1890, at Cuxton (Tyrer); June 9th-23rd, 1890, at Eastbourne (Fox); September 6th, 1890, and June 3rd, 1891, in Queendown Warren (Tyrer); well out September 3rd, 1891, at Eastbourne (Adkin); September 1st-5th, 1891, at Sidmouth (Wells); September 1st-9th, 1891, near Chatham (Tyrer); September 5th-9th, 1891, at Seaton (Prideaux); September 13th-20th, 1891, at Folkestone (Austin); May 13th, 24th, 1892, in the Isle of Purbeck (Bankes); June 2nd-12th, 1892, at Eastbourne (Tugwell); June 18th-26th, 1892, at Folkestone (James); August 4th-September 5th, 1892, at Folkestone (Adkin); August 6th, 1892, in the Isle of Purbeck (Bankes); September 1st-10th, 1892, at Ventnor (Hollis); September 5th, 1892, near Redhill (Buckell); September 17th, 1892, still in fine condition at Dorking (Prideaux); September 20th-27th, 1892, at Folkestone (Mera); first brood ♂s swarming by April 30th, 1893, at Dorking (Prideaux); May 6th, 1893, well out at Cuxton, in great abundance May 20th, (Tutt); May 10th-12th, 1893, in the Isle of Purbeck (Bankes); May 13th, 1893, at Horsley (Turner); July 20th, 1893, at Sandown, Brading, and Ventnor (Prout); July 22nd, 1893, well out at Cuxton, and still out on August 22nd (Tutt); second brood abundant by July 23rd, 1893, at Dorking (Prideaux); August 1893, above Box Tunnel, near Bath (Greer); August 11th, 1893, abundant, but going over, on the Cotswolds (Shipp); August 23rd, 1893, at Folkestone (Huckett); May 14th, June 2nd, 1894, common on Ranmore Common, June 9th, 1894, at Reigate (Turner); May 16th, 1894, onwards, at Stonehouse (Nash); May 20th, 1894, at Dorking (Prideaux); June 9th-12th, 1894, at Glynde, Hailsham (James); June 9th, 1894, fully out at Reigate (Adkin); June 14th, 18th, 1894, common at Riddlesdown (T. B. Fletcher); June 16th, 1894, at St. Catherine's Hill, near Winchester (Alderson), early August, 1894, at Ventnor (Wheeler); August 29th, 1894, at Caterham (Bower); August 26th-

31st, 1894, at Eastbourne (Adkin); September, 1894, in the Cheltenham district (Robertson); September 4th-12th, 1894, at Riddlesdown, September 11th, 1894, at Parkdown (T. B. Fletcher); June 9th, 1895, at Box Hill, August 6th, 1895 at Clandon (Turner); August 1895, at Buckland Dinham, near Frome (Mathew); August 8th, 1895, and onwards, round Carisbrooke Castle (Prideaux); August 15th-29th, 1895, in the Chatham district (Esam); September, 1895, at Eastbourne (Montgomery); September 5th, 1895, near Eastbourne (Winkley); in May, 1896, at Winsley (Sladen); May 20th, 1896, earliest date in the Ashford district (Wood); May 23rd, 1896, at Reigate (Prideaux); May 25th, 1896, at Ripley (Simes); May 31st, 1896, at Shoreham, Kent (Turner); June 4th, 1896, at Oxted (Sheldon); end of July, 1896, at Winsley (Sladen); August 1st-18th, 1896, at Folkestone (Page); August 16th-September 20th, 1896, at Reigate (Prideaux); about August 20th, 1896, in profusion at Ventnor (Prout); August 27th, 1896, in the Streatley district (Hamm); bred September 14th, 1896, from pupa formed August 19th (egg laid May 28th, hatched June 6th) at Reigate, June 4th, 1897, at Reigate (Prideaux); June 13th, 1897, scarce at Reigate (Turner); August 21st, 1897, at Reigate (Prideaux); August 27th, 1897, near Dover (Stacey); August 31st-September 21st, 1897, near Painswick (Stephens *teste* Watkins); September 9th, 1897, at Swanage (Hall); September 14th, 1897, about 4 miles from Painswick (Watkins); September 27th, 1897, latest date in the Ashford district (Wood); June 5th, 1898, at Reigate (Prideaux); June 11th, 1898, at Reigate (Adkin); June 21st-July 7th, 1898, on the hills near Folkestone (Hill); July 2nd-6th, 1898, at Cheriton and Folkestone (Heitland); August 25th, 1898, at Reigate (Prideaux); September 6th, 1898, at Caterham (Bower); September 17th-24th, 1898, at Kingswood, near Reigate (Phillips); May 24th, 1899, at Folkestone (Pickett); May 30th, 1899, at Reigate (Prideaux); August 1st-September 11th, 1899, at Swanage (Kemp); August 6th-September 30th, 1899, at Reigate; ova laid June 6th, larva hatched June 17th, pupated July 30th, imago emerged August 12th, 1899 (Prideaux); August 10th-27th, 1899, at Beachy Head (Carr); August 28th, 1899, at Folkestone (Pickett); September, 1899, on Aldbury Downs (Rothschild); September 4th, 1899, at Shoreham, September 14th, 1899, ♀s all worn at Caterham (Bower); May 24th, 1900, first seen at Dover (Stockwell); June 2nd, 1900, at Folkestone (Pickett); June 4th-17th, 1900, near Marlow (A. H. Clarke); June 9th, 1900, abundant in the Chilterns, the ♀s outnumbering the ♂s (Rowland-Brown); ♂s wasted by June 9th, 1900, at Reigate (Prideaux); June 10th, 1900, at Birdlip (Elwes); June 11th, 1900, at Shoreham, Kent, June 19th, 1900, in poor condition at Shoreham (Bower); June 11th, 1900, swarmed at Beachy Head (Blenkarn); June 16th, 1900, at Banstead (Adkin); August 11th-27th, and September 19th, 1900, at Folkestone (Pickett); August 20th, 1900, and onwards, at Reigate (Prideaux); September, 1900, on Aldbury Downs (Cottam); May 27th-28th, 1901, at Ranmore (Oldaker); May 28th, 1901, at Folkestone (Pickett); from May 29th, 1901, onwards, at Reigate (Prideaux); June 2nd, 1901, at Marlow (A. H. Clarke); August 19th, at Ventnor (Gardner); August 20th, 1901, at Reigate (Prideaux); August 22nd, 1901, at Marlow (A. H. Clarke); August 23rd, 1901, at Cuxton (Burrows); August 24th-September 10th, 1901, in South Devon (Porritt); August 25th-September 15th, 1901, at Folkestone

(Pickett); August 28th, 1901, one near Lewes, in a spot where the insect swarmed the previous year (Dollman); September 12th, 1901, at Shoreham, Kent (Bower); May 26th, 1902, at Folkestone (Pickett); June 2nd, 1902, at Reigate (Prideaux); June 7th-24th, 1902, at Ranmore (Oldaker); June 20th, 1902, at Shoreham (Bower); June 25th-30th, 1902, ♂s in fine condition near Dover (Carr); June 27th, 1902, fairly common on Aldbury Down (Barraud); August 27th, 1902, at Cuxton (Burrows); August 24th-September 14th, 1902, at Folkestone (Pickett); September 1st-15th, 1902, at Folkestone (Butler); September 28th-October 12th, 1902, at Reigate (Prideaux); June 2nd. 1903, at Folkestone (Pickett); June 3rd, 1903, first of the year at Ranmore (Oldaker); June 5th-18th, 1903, at Folkestone (Pickett); June 16th, 1903, at Reigate (Prideaux); July 2nd, 1903, near Steyning (Bird); July 6th, 1903, the first brood at Folkestone well out, a very late season (Kingsman); August 27th-September 6th, 1903, rare at Folkestone (Pickett); August 29th, 1903, at Cuxton (Burrows); September 1st, 1903, at Reigate (Prideaux); May 27th, 1904, and on through June, at Folkestone (Pickett); June 2nd, 1904, first of the year at Ranmore (Oldaker); June 4th, 22nd, 1904, in the Isle of Purbeck, June 17th, 1904, at Blandford (Bankes); June 10th, 1904, at Dorking, still freshly-emerged ♂s, July 11th, at Reigate (Prideaux); bred from eggs deposited in June, emerged September, 1904, very small even for a second brood (Joy); August 13th, 1904, near Freshwater (Rowland-Brown); September 4th-14th, 1904, at Folkestone (Pickett); September 3rd-October 4th, 1904, at Reigate (Prideaux); October 15th, 1904, at Folkestone (A. H. Clarke); May 29th, 1905, at Reigate (Prideaux); June 3rd, 1905, and on through the month, at Folkestone (Pickett); June 14th, 1905, at Reigate, fairly common and in perfect condition (Image); June 24th, 1905, at Reigate (Turner); August 15th, 1905, at Reigate (Prideaux); August 27th-September 9th, at Folkestone (Pickett); three ♂s taken in early September, 10 days after the early frosts of 1905 (Hodgson, *Ent. Rec.*, xviii., p. 53); first seen May 24th, still emerging June 4th, 1906, at Folkestone (Pickett); May 28th, 1906, at Dorking (Prideaux); May 28th, 1906, at Ranmore (Oldaker); August 8th, 1906, at Abbotsbury (Hopson); August 15th, 1906, at Ranmore (Oldaker); August 18th, 1906, at Reigate (Prideaux); first seen August 25th, from September 1st-9th, in great abundance, at Folkestone, and still swarmed at the beginning of October, 1906, on ground where the first brood had been very scarce, and the ground burnt (Pickett, *Ent. Rec.*, xviii., p. 292); June 3rd, 1907, and on until early July, at Folkestone (Pickett); June 20th, 1907, in the Isle of Wight (Main); June 28th, 1907, near Freshwater (Wright); August 26th-September 3rd, 1907, at Folkestone (Pickett); August 29th, 1907, common on a heath near Newbury (Rowland-Brown); May 26th, 1908, and on through June, again August 28th-September 14th, 1908, at Folkestone (Pickett); June 6th, 1908, at Eastbourne, June 7th, 1908, at Ranmore, abundant (Turner); August 28th-October 4th, 1908, at Ashford (Wood); September 5th and 8th, 1908, at Dorking (Wheeler); May 24th, 1909, at Reigate (Chapman); May 31st, 1909, at Ventnor (Sperring); May 31st, 1909, at Cuxton (Tutt); June 2nd-15th, and then September 2nd-7th, 1909, at Folkestone (Pickett); bred September 2nd-13th, 1909, from eggs laid at Reigate by a local ♀ (Chapman); 2 ♂s emerged November 8th and 17th from pupæ obtained from laggard larvæ belonging to same brood, another still in pupa (November 20th) (Tutt); September 3rd, 1909, very fresh and common at Gomshall (Wheeler); September 11th-12th, 1909, abundant at Folkestone (Bell); September 27th, 1909, still out commonly near Eastbourne (Adkin). On the continent—September 5th, 1844, at Foligno (Zeller); August 15th, 1847, in the Bois de Boulogne (Bellier de la Chavignerie); September 19th, 1865, at Montrouge, near Paris (Fallou); May 15th, 1866, on Mount Parnassus (Merlin coll.); in July, 1866, at Como (F. B. White); June 19th, 1869, at Meseritz (Zeller); April 22nd, 1870, at Bex (Murray); July 10th, 1870, on Mount Olympus (Merlin coll.); May 14th, 1872, at Avignon (Walker); October 1st-4th, 1873, on the slopes of the Gaisberg (Richter); mid-August, 1876, in Kanderthal, Chur, Bellagio, Menaggio, Val Vedro (Forbes); June 28th-July 5th, 1878, on the Riffelberg (Jordan); May 22nd, 1880, near Alferce (Eaton); May 12th, 1881, at Lambessa (Elwes); September 1st, 1882, at Pierrefitte-Nestalas, at 1665ft. above sea-level (Jones); June 10th-14th, 1883, in Visp Valley, June 16th, 1883, between St. Rémy and Aosta (Bethune-Baker); August. 1883, at Uriage, August 21st, 1883, in the Bois Taille (Reverdin); May 26th, 1884, at Capite de Vésenaz (Reverdin); May 24th, 1885, at Hermance (Reverdin); July 2nd, 1885, in the Engadine (Elwes); June 14th, 1885, and September 3rd, 1885, at the foot of Mt. Salève (Blachier); May 24th, 1886, at Hermance (Reverdin); June 1st-7th, 1886, at Brunnen (Jones); found rarely near San Roque, April 30th, 1887 (J. J. Walker); May 30th, 1887, at Lugano (Jones); June 12th-19th, 1887, at Bagnères-de-Luchon, June 29th-July 11th, 1887, at Vernet, July 20th, 1887, at St. Sauveur (Elwes); July 1887, near San Roque (J. J. Walker); May 8th, 1888, at Beaulieu (Jones); June 5th, 1890, at Digne (A. H. Jones); June 11th, 1891, at Trieste (de la Garde); in the first half of June, 1892, near Czernowitz (Hormuzaki); April 20th, 1893, in Corsica (Coleby); June 1st, 1893, at la Turquie, in Dordogne (Tarel); May 1st-7th, 1894, at Digne (Jones); May-June, 1894, in the Chiasso district (Knecht); May 14th and June 8th, 1894, in the Bois des Frères, May 17th, 1894, at Hermance (Reverdin); July 29th, 1894, at Bourg St. Maurice, August 18th, 1894, at Aosta, August 21st, 1894, at Grésy-sur-Aix (Tutt); August 3rd, 1894, near Bozen (Stange); May 28th, 1895, at Versoix (Reverdin); July 24th-27th, 1895, at Gerolstein in Rhenish Prussia (Jones); March 27th, 1896, at Estoril (Oldfield); June 1st, 1896, at Bois des Frères, June 21st, 1896, at Bois Taille (Reverdin); June 7th, 1896, near Bruchsal (Gauckler); July, 1896, at Gandria; July, 1896, at Cassarate (Tutt coll.); between July 20th-August 15th, 1896, at St. Sauveur, at 3000ft. (Bath); August 2nd, 1896, between Montreux and les Avants (Rowland-Brown); July 27th-28th, 1896, at Grésy-sur-Aix; one worn at le Lautaret, between July 30th-August 5th, 1896, at an elevation of at least 7000ft. (Tutt); August 12th-19th, 1896, at Bourg d'Oisans, August 18th, 1896, at Bourg d'Aru (Tutt); April 1st-12th, 1897, in the Cannes district (Chapman); April 20th- 23rd, 1897, just commencing to emerge at Digne (Tutt); May 17th, 1897, at the foot of the cliffs at Lavey (Wheeler); June 18th-26th, 1897, at Fontainebleau; July 24th-27th, 1897, at Grésy-sur-Aix (Tutt); August 6th-25th, 1897, at Bérisal (Wheeler); August 1st-20th, 1897, at Bérisal and Saas Fée (Rowland-Brown); freshly-emerged August 10th-20th, 1897, at Susa (Tutt); August

28th, 1897, at Gruyères (Rowland-Brown); September 4th-15th, 1897, at Trieste, September 18th, 1897, at Pirano (Mathew); April 28th, 1898, in the Val d'Ombla (Nicholl); June 11th-13th, 1898, at Trieste (de la Garde); July 11th, 1898, at Bucharest (Burr); July 15th, 1895, at Isle, August 2nd, 1898, at Mt. Tendre (Mory), August 1st-30th, 1898, at Bérisal (Wheeler); July 26th, 1898, at Grésy-sur-Aix, August 6th, 1898, at Bourg St. Maurice, August 3rd-10th, 1898, at Pré St. Didier, rare (Tutt); August 8th, 1898, at the Chapelle St. Laurent, near Zinal (Rowland-Brown); August 26th, 1898, at Niouc (Reverdin); August 26th-29th, 1898, at Neuchâtel (Rowland-Brown); May 1st-19th, 1899, at Veytaux (Wheeler); May 18th, 1899, at Bois Taille, June 4th, 1899, on the Grand Salève (Reverdin); May 21st, 1899, on the Vitoch, May 23rd, 1899, at Slivno, June 12th and 26th, 1899, in the Rilska Valley (Nicholl); June 4th, 1899, at Digne (Rowland-Brown); taken at Slivno early June, 1899, June 24th, 1899, on the Rilo Dagh, and also on the north slope of the Balkans, July 23rd, 1899 (Elwes); June 22nd-30th, 1899, abundant at Susa (Rowland-Brown); June 25th, 1899, at Nice, June 28th-July 7th, 1899, at St. Martin-Vésubie (Lang); June 28th, 1899, at Budapest (Aigner-Abafi); July 1st-12th, 1899, at Fusio (Chapman); July 1st-13th, 1899, worn at Zmutt, St. Niklaus, etc. (Rosa); July 15th-August 25th, 1896, in the Brenner district (Galvagni); July 18th-20th, 1899, at Digne (Lang); July 24th-27th, 1899, at Grésy-sur-Aix, August, 22nd, 1899, at Fontainebleau (Tutt); August 26th-September 6th, 1899, in the Lucerne district (Sanford); September 1st-7th, 1899, at Sierre (Wheeler); May 12th-16th. 1900, abundant near Orta (Lowe); [June 9th, 1900, near Hasbeyah (Nicholl) (? *A. coridon* var. *syriaca*);] June 23rd-24th, 1900, at Montsény (Witty); July 1st-20th, 1900, a single specimen at Pontresina (Chapman); July 7th-21st, 1900, on the Simplon Pass (Rosa); July 12th, 20th, 1900, at Herculesbad, July 20th, 1900, at Belgrade (Lang); July 18th, 1900, at Macolin (Reverdin); July 21st-August 9th, 1900, in the Brenner district (Galvagni); July 21st. 1900, at Pontresina (Chapman); in great abundance August 1st, 1900, at Gimmelwald (Wheeler); August 1st-7th, 1900, at Larche, August 18th-24th, 1900, at Grésy-sur-Aix (Tutt); May 9th, 1901, at the Caldas de Maravilla, May 18th-20th, 1901, at Granada (Nicholl); June 16th, 1901, between Focha and Celebic (Nicholl); June 20th-25th, 1901, at Bozen (Lowe); June 25th, 1901, at Jesero, June 28th, 1901, at Jaice (Elwes); July 14th, 1901, in the Cevennes (Rowland-Brown); July 31st, 1901, at Lucina on the Prenj, at 1500m. (Penther); August 9th-18th, 1901, at Bobbie (Tutt); March 16th-May 3rd, 1902, in Andalusia (Lang); May 14th, 1902, and following days at Locarno (Chapman); June 4th, 1902, at Branson, June 26th-July 1st, 1902, at St. Georges in the Jura (Wheeler); June 23rd-29th, 1902, at the Certosa di Pesio (Lowe); June 26th-30th, 1902, at Sauchay (Moore); June 27th, 1902, near Martigny (Sheldon); just appearing July 25th, 1902, at Grésy-sur-Aix (Tutt); September 2nd, 1902, near Sonzier, September 9th, 1902, at Follaterre (Wheeler); October 9th, 1902, near Beaulieu, October 16th, 1902, at St. André, October 18th, 1902, at Digne (Rowland-Brown); April 17th-May 20th, 1903, at Tchekirghé, near Broussa, May 28th, 1903, onwards, at Amasia (Fountaine); April 20th, 1903, near Menaggio (Sich); April 27th-May 3rd, 1903, at Digne (Sheldon); May 13th, 1903, at Sion, May

16th, 1903, at Brigue, May 19th, 1903, at Aigle, June 6th, 1903, at Martigny (Wheeler); June 26th-29th, 1903, between Engelberg and Schwand (Keynes); July 7th, 1903, in the Pfynwald (Wheeler); July 9th, 1903, at Chexbres (Walker); July 25th-28th, 1903, at St. Martin-Vésubie (Rowland-Brown): July 29th, 1903, a ♀ in the Combe d'Arolla, August 13th, 1903, near Vex (Tutt); August 31st, 1903, at Bois Taille, September 27th, 1903, on the Petit Salève (Reverdin); May 29th, 1904, at Gonat, June 1st-4th, 1904, at Panticosa, June 14th, 1904, at Fiente de Salvador, near Jaca (Burr); Easter, 1904, in Majorca (Muschamp); June 7th, 1904, near Villars (Wheeler); June 19th, 23rd, 1904, at Macolin (Lowe); July 8th and 23rd, 1904, at Brides-les-Bains (Reverdin); July 9th, 1904, at Digne (Muschamp); July 15th-September 3rd, 1904, in the Pistoiese Apennines (Verity); August 1st, 1904, at the foot of the Grand Salève, August 11th, 1904, at Saas-Fée, August 18th, 1904, at Stalden, August 20th, 1904, Zermatt to Stalden (Tutt); August 3rd, 1904, at Hermance (Blachier); very common end of September, 1904, at Dinant, etc. (Derenne); April 23rd, 1905, at Granada, June 12th, 1905, at Martigny, July 1st, 1905, on the Simplon, July 12th, 1905, at Campolungo (Muschamp); June 16th, 1905, at Montserrat, June 17th-27th, 1905, at Vernet-les-Bains (Standen); June 21st, 1905, at Martigny, July 12th, 1905, at Binn, July 25th, 1905, at Bérisal (Blachier); May 2nd-6th, 1905, at Draguignan (Tutt); May 28th, 1905, at Versoix, June 8th, 1905, on the Grand Salève, June 20th, 1905, in the Bois des Frères (Reverdin); June 13th-16th, 1905, at Montserrat, June 18th, 1905, and following days at le Vernet (Standen); June 26th, 1905, at Oberstdorf, in the Allgau Alps, June 27th, 1905, in the Oythal, June 28th, 1905, on the lower slopes of the Seealp, July 2nd, 1905, on the Sölleneck (Dadd); June 29th-July 12th, 1905, in the Wengen district (Moss); July, 1905, in Morocco (*teste* Blachier); July 8th, 1905, at Bérisal (Wheeler); July 11th, 1905, between le Vernet and Carsteil, July 24th, 1905, at Val de Poneyespée, Gavarnie (Rowland-Brown); July 28th-31st, 1905, at Grésy-sur-Aix, August 19th, 1905, at Châtillon, August 21st, 1905, in the Val Anzasca, August 25th, 1905, at la Bâtiaz (Tutt); August 10th, 1905, in the Val Antigorio (Blachier); April 15th, June 10th, 1906, at Digne (Muschamp); May 6th, 1906, in the Bois des Frères, May 13th, 1906, at Hermance, May 31st, 1906, at Versoix (Reverdin); May 17th, 1906, at Digne (Blachier); May 19th, 1906, at Podsused (Grund); May 22nd, 1906, at Bex, May 26th, 1906, at Lavey, June 5th, 1906, at Caux (Wheeler); June 1st-24th, 1906, near Freiburg (Keynes); June 6th, 1906, at the foot of Mt. Salève (Blachier); June 10th, 1906, at Voirons (Reverdin); July 10th, 1906, in the Roseg-Thal (Keynes); July, 1906, at St. Moritz and Pontresina (Bethune-Baker); July 27th, 1906, in the gorge of the Guadalaviar, near Albarracin (Sheldon); August 4th-6th and 19th, 1906, at Digne (Tutt); August 10th, 17th, 1906, between Colmars and Allos, August 21st, 1906, at Grésy-sur-Aix, August 24th, 1906, at Versoix (Tutt); August 11th, 1906, at Eclepens, August 27th, 1906, at Fiesole, September 3rd, 1906, very fresh at Martigny (Wheeler); August 22nd, 1906, at Martigny (Reverdin); May, 1907, at Sebdou (Powell); May 12th, 1907, at Digne (Rowland-Brown); May 20th, 1907, at Territet, May 27th, 1907, at la Bâtiaz, May 30th, 1907, at Sion, May 31st, 1907, between Caux and Sonzier (Tetley); May 20th, June 3rd, July 30th, 1907, at

Geneva (Muschamp); May 24th, 1907, at Bex (Wheeler); May 25th, June 6th, July 31st, 1907, at Versoix, June 2nd and 9th, 1907, at Hermance, June 20th, 1907, at Bois des Frères, July 14th, 1907, at Iselle, June 7th, 1907, at Plan Cerisier (Reverdin); June 8th, 1907, at Yvoire (Blachier); June 5th-12th, 1907, at Digne (Gurney); June 7th-10th, 1907, at Hermance (Muschamp); June 8th, 1907, in the Tinière Valley (Wheeler); June 16th, 1907, on the Salève (Muschamp); June 17th, 1907, at Villars, les Dourbes, June 19th, 1907, in the Eaux-Chaudes valley (Gurney); June 17th, 1907, in the valley of St. Vincent, le Vernet, June 25th, 1907, in the Vallée du Lys (Keynes); June 24th, 1907, at Digne (Blachier); July 5th-7th, 1907, at Martigny (Rehfous); August 13th, 1907, at Vernayaz (Page); August 18th, 1907, at Weissenstein, August 23rd, 1907, in the Via Mala (Tutt); August 30th, 1907, at Veyrier (Blachier); September 7th, 1907, at Bois Taille (Reverdin); October 13th, 1907, on the Gösseck in Upper Styria (Hoffmann); May 21st, 1908, at Versoix (Blachier); May 28th, 1908, at Allondon (Reverdin); June 2nd-8th, 1908, between Budafok and Kelenfold, June 10th-14th, 1908, at Czerna (Rosa); June 5th, 1908, on Mt. Pélerin (Tetley); June 13th-24th, 1908, at Bérisal (Prideaux); June 14th, 1908, at Versoix (Reverdin); June 18th, 1908, at Dompierre-sur-Mer (Oberthür); August 2nd, 1908, at Barcelonnette (Rowland-Brown); August 2nd, 1908, at Versoix, August 22nd, 1908, at Martigny (Reverdin); August 12th, 1908, at Thoiry (Blachier); August 12th, 1908, above Zernetz, August 13th, 1908, on the Ofen Pass, August 14th, 1908, in the Muranza-Thal, August 17th, 1908, at Gomagoi (Tutt); May 18th-June 7th, 1909, at Branson, May 23rd-June 23rd, 1909, at St. Triphon, May 25th, 1909, at Sonzier, May 30th, 1909, in the Tinière Valley, June 16th, 1909, at Salquenen, June 17th, 1909, in the Pfynwald, June 20th, 1909, at Bérisal (Alderson); May 23rd, 1909, at Versoix, May 20th, 1909, at Hermance, May 30th, 1909, at Martigny and Branson, June 15th, 1909, at Bois des Frères, June 17th, 1909, at Bois Taille (Reverdin); May 27th, 1909, at Esperia, June 3rd-20th, 1909, on the Aurunci Mts., at 3000 ft. (Barraud); May 29th, 1909, on Mt. Voirons, June 2nd, 1909, on the summit of Mt. Salève (Blachier); May 30th, 1909, on the Svábhegy, near Budapest (Sheldon); June 18th and 21st, 1909, just emerging at Fiesole, June 28th-July 10th, 1909, at Assisi (Wheeler); July 1st, 1909, on the Dent de Vaulion, July 5th, 1909, at Eclepens, July 18th-August 18th, 1909, on Mont Tendre, July 21st, 1909, at Asile de Molendreuz, July 19th, 21st, 24th, 26th, 1909, in the Vallée de Joux (Gibbs); August 10th-14th, 1909, at Mende (Rowland-Brown).

HABITS.—There can hardly be a second thought that this is the loveliest of all our native blues. A stretch of down along which the beautiful ♂ s of this species are sometimes to be seen flitting or basking in the sun in hundreds, is really a brilliant spectacle; whilst a wayside bank, as at Draguignan, or a weedy field as at Digne, may appear to be alive with the glorious creatures. The butterfly almost always emerges between 9 a.m. and 10.30 a.m., rarely appearing at any other time, and, if the sun be shining, is soon ready for flight. The ♂ s look very large and robust compared with those of *Polyommatus icarus*, which usually occur in the same habitats, and its delightful colour makes it most conspicuous. The ♂, when actively on the wing, flies rather swiftly, with a somewhat zigzag flight, showing alternately the blue upper- and the grey underside of the wings, when viewed sideways, but looked at from above, the loss of blue is so short, if it takes place at all, that it only appears to give a twinkling appearance to the insect, and its forewings are seen then to be somewhat pushed back as in the case of most other blues. A ♂ observed in the Via Mala, August 21st, 1907, left the flowers and flew along the road, when it seemed to advance much more warily and quickly, and the blue upperside seemed to be quite continuously in sight. When thus active, the ♂ can be very pugnacious, although it comparatively rarely attacks another ♂ of its own species; we have seen it repeatedly assault *Polyommatus icarus*, and, at Folkestone, *Hipparchia semele* has more than once been observed as the object of its enmity; whilst once, high on the Wormser Joch (August 13th, 1908), a bevy of quarrelling "blues" were netted, consisting of 3 ♂ *A. coridon*, 1 ♂ *A. thetis* (*bellargus*), and 3 ♂ *Albulina pheretes*. When it settles in the full sunlight, it adjusts itself so that the sun falls directly on its wings, but it seems to matter little whether its head or tail is upwards, so long as it obtains the full effects of the sun's rays; at this time, it rarely stays long in one position, and almost continuously moves its hindwings wheel-like, alternately up and down, this movement frequently occurring when the wings are drawn up over the back, the hindwings being slightly lowered during the movement, as well as when the wings are let down somewhat, when the costa of the hindwings is apparently pressed very closely to the underside of the inner margin of the forewing. When the insect is sunning, the wings are let down until they are about 20° or 30° from the horizontal, the forewings thrown well forward, and the hindwings pulled well back and under the abdomen, so as to show the dark costa of the hindwings, choosing a piece of hot bare chalk or a prominent point on the herbage. When the butterfly walks, the legs on either side move alternately, but when about to fly, the forewings are drawn quickly backwards and downwards, and the movement of the body occurs simultaneously. This species is attracted in hot weather to the puddles on the pathways in the lower alpine valleys and elsewhere, but in less abundance than some other species, *e.g.*, just below Bourg d'Aru, in August, 1896, we noted the ♂s consorting with swarms of *Hirsutina damon*, *Agriades coridon*, etc., at the little runnels crossing the roadways, whilst in August, 1908, we also saw it at the rills in the ascent to the Ofen Pass, with *Agriades coridon*, *Aricia donzelii*, etc. In June, 1899, herds of *A. thetis* with *Cupido sebrus*, *C. minimus*, *Polyommatus escheri*, *P. icarus*, and *Cyaniris semiargus* were observed on the little islets of rich black mud, in the bed of the Eaux-Chaudes stream just above the baths near Digne, sucking the moisture in the sun (Rowland-Brown), whilst Prideaux notes (*in litt.*) that the habit, so frequently noticed abroad, of the imagines coming down to drink at the roadside puddles, was observable in hot summers on Reigate Hill, and Prout writes that, on certain days about August 20th, 1896, near Ventnor, it was a sight to see this insect fly up in clouds from the warm chalk, stones, animal droppings, etc., on Boniface Down. But the butterfly is not always active in the hot sun, for it loves also at this time to feed at flowers, and is then barely to be disturbed; in the spring, in Britain, flowers of thyme and *Lotus* are among its chief attractions, in the autumn, thyme, *Centaurea scabiosa*, and a yellow hieracium also offer great attractions, and Prideaux notes that the ♂s of this species, together with those of *A. coridon*, *Polyommatus icarus*, and *Aricia* *astrarche*, were frequent visitors to his garden at Reigate Hill (which was near their breeding-grounds), where they particularly favoured the cultivated species of *Centaurea* ("sweet sultans"). On a hot sunny day (August 19th, 1907), at Weissenstein, on the Albula, we observed a splendid ♂ sunning on a scabious flower, its wings wide open so that the sun shone fully on them. We have seen them in numbers at Digne, in the hot sun, apparently almost intoxicated with the nectar of the flowers of thistles, lucerne, thyme, *Eupatorium*, and endless other attractive species of plants; at any rate, they appeared to do literally nothing except feed, they flew less, and seemed here to be much less assertive and pugnacious than either *Polyommatus icarus* or *Agriades coridon*, although, if disturbed, they more than held their own against all comers. Apart from the pairing-habits, which are quite distinctive, the sexes appear to have certain amusements in common with other blue butterflies; the ♀ flies up some little distance into the air, the ♂ following her, but remaining a few inches behind her, then pressing her on as it were, he follows until she comes down and settles, when he takes up a position just behind her, nor does he appear to move until she again gets restless, and recommences her flight. It has occasionally been reported that the ♂ of this species has been seen *in cop.* with ♀ *P. icarus*, *e.g.*, *Proc. Ent. Soc. Lond.*, 1886, p. xxxi, etc.; on September 11th, 1909, we watched a ♂ follow up a ♀ *P. icarus* as she moved slowly about in the herbage, hovering over her in a very suspicious manner, but finally flying away without making any attempt to pair with her. Verity notes (*Bull. Ent. Soc. Ital.*, 1905, p. 138) that, at the end of August and early September, 1901, he saw the species near Lucca, in extraordinary abundance; it was, he says, a marvellous spectacle to see hundreds and hundreds of these brilliant gems settled on the flowers and foliage, whilst as many were on the wing, now disappearing a moment in shade, and reappearing in sunshine, whirling round five or six at a time, and creating an effect on the eye recalling that of the fireflies in the corn during the beautiful nights of June. The ♀s, when sunning, hold the wings generally considerably above the horizontal, almost as do the ♂s, sitting with the forewings well forward, and the hindwings, pulled far back, the inner margin of the latter extending under the abdomen, so that there is a large angle between the fore- and hindwings; the forewings, in this position, usually have the inner margin slightly raised above the level of the hindwings, and are somewhat curved convexly between the middle of the wing and the outer margin. They exhibit the same habit as the ♂s, of moving the hindwings alternately when thus at rest, haunting the same flowers for nectar. When apparently searching for a spot to deposit an egg, the ♀ flies a short distance, about 10 or 12 inches at each movement, crawls over a variety of plants other than the real foodplant, projects the antennæ well in front, and keeps them moving alternately. When feeding during the day, both sexes sit with the forewings thrown well forward over the head, and with only a small angle between them and the hindwings, the antennæ held well in front at a wide angle, but, when resting, the forewings are pulled low down between the hindwings, and the antennæ thrown up and extended from one another almost at right angles; at this time, the costa of each forewing is pulled very close down to the costa of the hindwings, whilst the inner margins of the latter are folded into a loose tube for the body, the anal areas of the two hindwings being slightly expanded as it were to form a sort of opening to the tube; the insect often sits on a leaf so that the body is quite horizontal, and extended far beyond the leaflets to which the legs are clinging. When crawling, the body hangs freely below the hindwings, and the antennæ are moved a good deal from side to side as the insect travels slowly along; but when a ♀ is apparently seeking the right plant for egg-laying, she works through grass and other low herbs, pushing, as it were, her way among the undergrowth. If a ♀ be removed from a dark to a sunny position, she opens her wings so that the light falls thereon, and adopts the position already described when the insect is sunning in the open. After being closed in a box for some 60 hours, four ♀s were attracted at once by a lump of moistened sugar, and fed most greedily, touching the sugar with the ends of their antennæ, and uncoiling their tongues, which they soon inserted in a suitable place, remaining motionless, two with the forewings depressed as much as when asleep, the other two with the forewings rather more prominent, and so that the discoidal of the forewings showed on the underside, as well as the three upper spots of the submedian series. Although dull, the butterflies remained feeding for a full hour, but a glimpse of sun took them off the sugar, and they separated to sit with expanded wings. When disturbed in dull weather, the butterfly falls directly to the ground, with its wings drawn well in, and remains there for a few moments before moving sideways to a place of safety; if further disturbed, it makes a series of short jumps, falling on its side each time. At the end of a fine afternoon, it is really delightful to see dozens of these beautiful insects of both sexes taking up a position on a flower, a dead *Centaurea* stalk, or grass culm, so that their wings face the setting sun, and make them conspicuous a long way off; then, as the sun goes off the bank, they slowly close their wings, change their position, and sit head downwards near the top of the plant on which they rested. In dull and damp weather it is next to impossible to find the butterflies in their haunts, but if the sky be merely misty, or covered with a light cloud so that the diffused sunlight makes itself felt, the butterflies of both sexes will sit immovable for a very long time with both wings expanded in the direction of the sun, almost as if they were "sunning" in the full sunlight. The choice of favourite spots for roosting has often been remarked upon, and on the Kent and Surrey downs, where the vegetation is of comparatively uniform character, the observer, with his back to the setting sun, is enabled to detect the groups even at a considerable distance. This species, when roosting, confines itself largely to the neighbourhood of its special *Hippocrepis*-covered haunts, where it is usually joined by *Polyommatus icarus* and oftentimes by *Rumicia phlaeas*. Adkin describes (*Proc. Sth. Lond. Ent. Soc.*, 1891, p. 169) the way in which this species hides at night, noting that, on fine early evenings, the imagines were found commonly at rest on grass stems, knapweed flowers, etc., but when it was dull and stormy, they rested in much more sheltered positions, chiefly low down among the roots of the plants. The species seems to have a fairly long individual life. Of four females captured on September 11th, 1909, one only in really fine condition, three died on the 20th, 21st, and 22nd respectively, but the fine one lived till September 29th, and seemed in very good health till the 26th; it did not come with much energy to feed on the 27th, on the 28th stood quite still all day, without capacity for eating, and on the 29th was still standing in the same place, dead.

Habitats.—Rough slopes at the foot of the chalk and limestone hills of the southern counties of England, sparsely clad chalk or limestone downs, rough uncultivated meadows on chalk, and similar localities where *Hippocrepis comosa* grows, are the favoured haunts of this excessively local species in Britain. Hence it occasionally visits gardens in the neighbourhood, as noted by Webb at Dover, in 1896, and at Reigate, between 1896 and 1900, by Prideaux. It lives in "the Warren" at Folkestone, quite on the face of the cliffs, as well as on the sweep of downs above the town; it is found on the cliffs near Beachy Head, stretching back inland on the chalk range, of which this is the termination, abounds on the slopes near Reigate, and is found, in fact, in most suitable places on the downs of Kent, Surrey, Sussex, Berks, Hants, and the Isle of Wight, extending into the counties of Hertfordshire, Bedfordshire, Bucks, Wilts, Oxfordshire and Gloucestershire, on similar ground, where, however, the number of its localities is exceedingly small; it is locally common on the chalk and limestone hills and downs in Dorset, on the limestone cliffs near Babbacombe in Devonshire, in a small rough field near the railway at Buckland Dinham, near Frome, in Somerset, on the oolitic limestone above Box Tunnel near Bath, and occurs in Gloucestershire on the Cotswolds, near Painswick, etc., but, except in the counties mentioned, does not now occur elsewhere in the British Isles. Even in some of these localities, it is very local; on the Ranmore slope, in Surrey, it is found commonly on a piece of ground 100 yards by 30 yards, but it is not to be seen anywhere else. Prout observes (*Ent. Rec.*, iv., p. 278) that, in July, 1893, the second-brood of this species reappeared in some of its old haunts near Sandown and Brading, after an absence of some years. The history of its taking possession, and losing hold, of ground in Bucks and Oxford, is related at length by various observers; thus Clarke notes (*Ent. Rec.*, xiv., p. 24) that, on a hill near Marlow, where the butterfly had hitherto been quite unknown, it appeared for the first time in 1899, continued in 1900 (a year in which the species was very abundant in Britain), appeared to have quite settled itself in 1901, but three years later, 1904, had entirely disappeared, due probably to the spread of tall coarse grasses that had replaced the few patches of *Hippocrepis* (*op. cit.*, xviii., p. 23). Similarly, in 1899, the species occurred for the first time on the chalkdowns to the south-east and east of Oxford; an odd specimen had been captured in 1894 or 1895 at Streatley, but, in 1899, on the downs between Streatley and Blewberry, it was observed in abundance in various places, where it had not been noticed, and it was suggested by Holland (*Ent. Rec.*, xiv., p. 50) that it had reached Marlow (see *suprà*) by way of the Berkshire downs; Bell also noted it for the first time in early September, 1899, on Pyrton Hill, in the Oxfordshire Chilterns, where also it was found in 1900 and 1901 (*op. cit.*, p. 51), but this sudden recrudescence and extension of the haunts of the species must have been due to generally favourable local conditions, as the species was well-known to Henderson, on the Streatley downs, in 1869 and following years (*Ent. Rec.*, xiv., pp. 136-7), and it possibly retained a precarious hold of the ground through the intervening years, which the year 1899, most favourable all over our southern counties for this species, changed into a bold bid not only for increase in its hardly-held haunts, but for extension into suitable spots in their comparatively near neighbourhood. We may here note that 1887, 1893, 1896, and 1899, were years in which the species was exceptionally abundant in England. Rowland-Brown notes how, in June 1900 (following a year of abnormal abundance of this insect), he found a small colony in the Chiltern Hills, between Kimble and Prince's Risborough, on ground that he knew well, and where he had never seen it before, nor has been able to find it since. Far different from our Kentish chalkhills are some of the habitats of this species on the continent, whilst others are very similar; thus, Lambillion says that, in Belgium, the insect is not rare in the limestone districts, both at higher and lower elevations. It is reported from an old quarry in Jersey. In northern France, Moore says that it lives on the northern slope of the steep hillsides facing Sauchay, a locality reminding one of a Surrey hillside with an abundance of juniper bushes, and such a profusion of purple orchis, as to make the hill look heather-clad at the end of June; in Seine-et-Marne, it is very common on the arid and hilly country around Gurcy; at Grésy-sur-Aix, it loves the bush-covered slopes on the outskirts of the woods that clothe the hills almost to their summit, where *Hipparchia arethusa* is perhaps the most conspicuous butterfly, and grassy slopes alternate with vineyards and lucerne fields, whence *A. thetis* spreads into the meadows lower down, in which large scattered lucerne bushes are to be found, and where it fraternises with *Plebeius argus* (*aegon*), *Polyommatus hylas*, *Aricia astrarche*, etc., but it is still more abundant at the flowers on a small piece of waste land on the upper edge of the wood near the top of the hills, where *Agriades coridon*, *Everes argiades*, and hosts of larger species make rendezvous. Very different again are the coast districts extending through la Vendée, the Charentes, and the Bordelais as far as Bordeaux, described by Oberthür. In la Vendée, *A. thetis* is very abundant, whilst *A. coridon* is rare, and here these inhabit the same ground as *Anthrocera hippocrepidis* var. *occidentalis*, whilst in the Charentes, where *A. coridon* is most abundant, these species are joined by *Anthrocera fausta*. Different again, are the steep shaly slopes between Colmars and Allos in the beautiful Verdon valley; as also the waste and fallow weed-covered fields on the arid hillslopes around Digne, particularly in the Eaux-Chaudes valley and the gorge with its steep rocky sides, and welcome torrent, just beyond "the baths," and the broad black mud-flats laid out by the river where this torrent is carried across the bed of the Eaux-Chaudes stream, as well as the lucerne fields by its side; in August, 1906, the ♂s were in abundance in the weed-covered fields, where it flew with large numbers of *Agriades coridon*, *Polyommatus icarus*, and *Aricia astrarche*, and fewer *Polyommatus meleager* and *P. hylas*; it also haunts the slopes from Bourg d'Aru to the junction of the Vénéon Valleys with the Romanche Valley, again a very different habitat from those just described. Standen notes it as occurring in June in a hot corner about a mile from Vernet, a hollow bend of the road, sheltered from any breeze that might be stirring, with *Polyommatus icarus*, *P. escheri*, *Aricia astrarche*, *Plebeius argus*, *Coenonympha arcania*, *Euchloë euphenoides*, and many other species. In Piedmont, near Aosta, the species was found with

Polyommatus meleager, in a dry watercourse with steep sides, covered with grass and thyme, whilst, along its lower edges, starved plants of the Alpine thistle could hardly support their yellow-green capitula, on which *Callimorpha hera* and *Lithosia unita* hung in great abundance, whilst the lovely soft grey-undersided *Hipparchia statilinus* haunted the rocks in the steep bed of the dried-up stream; it was also found in the lovely meadow-clearings in the pine-forest opposite Chatillon in the Val d'Aosta, as well as in the beautiful Val Anzasca; behind Susa, it occurs in a delightful rocky glen, the sides of which are clothed with chestnut and walnut trees, and large bushes of *Collutea arborescens*, round which *Lampides boeticus* was flying freely, but in the open parts of which the thyme-blossom attracted *A. thetis*, *Polyommatus hylas*, and many other interesting species; further south, in the Lucca district, Verity records it as swarming locally in a pine grove in September. In Spain, it affects a variety of situations, *e.g.*, it is common on the sandy ground near the sea at Bilbao (Seebold); flies in the gorge of the Guadalaviar, three miles below Albarracin, with *Polyommatus escheri*, *P. hylas* var. *nivescens*, *Agriades coridon* var. *hispana*, *Hirsutina admetus*, *Coenonympha dorus*, etc. (Sheldon); occurs on a ridge beyond the hill of the Alhambra at Granada, which falls in steep and well-wooded declivities to the Darro on the north, and in broken precipices and rocky glens to the Genil on the south, with hollows overgrown with cistus, broom, and lavender, and little mountain meadows brilliant with flowers (Nicholl). In Switzerland, it flies in a variety of vastly different habitats including the rough meadows at Versoix, the slopes of the Salève from the foot to its summit, the main and lateral valleys of the Rhone, reaching well up into the Combe d'Arolla, above Zermatt, Bérisal, Saas-Fée, etc.; it occurs on the slopes between Martigny and Vernayaz, as well as on marshy spots between Villars and Chesières, with an abundance of *Aricia eumedon*, and some *Loweia amphidamas*; indeed, Frey says that it occurs almost everywhere in the lowlands, is abundant at the foot of the Jura, and in many alpine valleys, extending up to 6500ft., whilst Wheeler considers it generally distributed and often common especially in the lowlands and lower slopes of the mountains, clearings of woods, etc. We have taken the species high up on the Albula Pass, above the Weissenstein Inn, where *Parnassius delius*, *Melampias epiphron*, *Erebia pronoë*, *E. tyndarus*, *Colias phicomone*, and other high alpine butterflies were on the wing; we also found it, with *Albulina pheretes*, where the Wormser Joch leads into the Muranza-Thal, as well as lower down in the valley, whilst again it occurred almost at the summit of the Ofen Pass, where *Pontia callidice* and swarms of *Erebia nerine* were the chief species noted; it appeared also on the flower-banks just beyond the Via Mala, and has been taken in many other high alpine habitats. The localities in the alps of Germany and Austria are very similar; in Tirol, the flower-clad slopes by the roadside and the openings into the pinewoods in the Sarnthal, and the stony thyme-strewn slopes in the Trafoi-thal just above Gomagoi, are typical localities, yet Nickerl says that it haunts meadows and clover-fields in Bohemia. Zeller also notes it as occurring in meadows at Flitsch in Carinthia, whilst Höfner notes that the species occurs in the valleys and extends up the Glockner to the well-known Pasterze, where it occurs with *Anthrocera exulans*. How different must be the latter locality from that, by the Adriatic, described by Mrs. Nicholl, a well-sheltered estuary, in the Val d'Ombla, about five miles from Ragusa, where the vegetation is much like that of the Italian Riviera, and this species occurs in April with *Cupido minimus*, *Glaucopsyche cyllarus*, *Scolitantides orion*, *Aricia astrarche*, *Polyommatus icarus*, *Anthocaris belia*, *Thais polyxena*, *Iphiclides podalirius*, *Papilio machaon*, etc., or the hill-side between Trieste and Miramar, where the ground is covered with scrub-oak, Spanish chestnut, heath, juniper, and broom, the flowers attracting butterflies in great numbers, of which *Agriades thetis* and *Aricia astrarche* are the most abundant (Mathew); or again, the rich meadows on both sides of the road leading through a deciduous wood on the north slope of the Cecina mountain, near Czernowitz, at an altitude of about 400 mètres, where *A. thetis* occurs with an abundance of *Polyommatus icarus*, *Everes argiades*, *Plebeius aegon*, *Cyaniris semiargus*, *Glaucopsyche cyllarus*, *Lycaena alcon*, etc. (Hormuzaki). On the Svábhegy, near Budapest, it occurs among oak-scrub, with glades running through and amongst it, flying with *Polyommatus hylas*, *P. icarus*, *Plebeius argus*, etc. (Sheldon). Habich records the species as occurring at Oberweiden, a locality charmingly described by Burr (*Ent. Rec.*, vol. xiii., p. 325) as a "faunistic island" in Moravia, with all the characteristics of the Volga region ; a small patch of ground where is an abrupt change of fauna from that of the surrounding country, most noticeable in the stationary forms of life; a row of small sandy hillocks in the oasis, whilst around the country is flat, dry, and barren, a little coarse grass in the sand forming the only vegetation. In the German mountains, we read of it occurring in abundance on the lower slopes of the Seealp with *Aricia astrarche*, *Polyommatus hylas*, *Coenonympha satyrion*, etc., in the lower alpine meadows on the Solleneck, with *Cyaniris semiargus*, *Lycaena arion*, *Cupido minimus*, *Polyommatus icarus*, *Colias hyale*, *C. phicomone*, etc. ; on a fine sunny bank at the junction of the Oy and Trittoch, with *Aricia astrarche*, *Lycaena arion*, *Cupido minimus*, *Melitaea athalia*, *M. dictynna*, etc., and on an extensive sandbank laid out by the river near Oberstdorf, overgrown with willows and other bushes, with *Plebeius argus* (*aegon*), *P. argyrognomon*, etc. (Dadd). In Bavaria, it also occurs in the hills near Friedberg, and in the meadows from Bergheim to Strassberg (Kolb); in Thuringia, it lives on the chalk hills near Jena (*Ent. Ver. Lep. Gera*), in Waldeck, in sunny flowery localities on limestone and slate formations (Speyer); in Hesse, it is very local, occurring by the roadside at Mörfeld, rarely on the hills, and more frequently in the Mombach forest (Koch); in the Rhine Provinces, it occurs on the sloping chalky banks of the Mundelheim and Budberg, and similar slopes leading to the rivers and in the adjacent meadows, the species being apparently a settled inhabitant of the marshy meadows of the Linn (Rothke), whilst one of its few localities in Prussia are the ramparts and earth-works of the fort Courbière, near Graudenz, situated about 200ft. above the Vistula, the adjacent ground being covered with an abundant and varied flora (Riesen). In the Balkan Peninsula, the species appears to be widely distributed both in the plains and mountains, occurring in a variety of situations, *e.g.*, it is found on the south-eastern slopes of the Vitoch, a mountain of some 6000ft. elevation, situated almost due south of Sofia, on some rough dry slopes, and wet fields, with *Plebeius argus* (*aegon*), *Everes argiades*, *Cyaniris semiargus*, *Aricia astrarche*, *Heodes thersamon*, etc., as well as on some broken ground in the Rilska valley, where granite blocks have rolled down the precipices into a sheltered meadow at the foot of the woods, and which are overgrown with all kinds of flowering weeds and intersected by a tiny stream, where it occurs with *Polyommatus anteros*, *P. hylas*, *P. icarus*, *Cyaniris semiargus*, *Aricia eumedon*, *Scolitantides orion*, *Loweia dorilis*, *Chrysophanus hippothoë*, etc. Near Slivno, it is found in a rough little valley among the vineyards with *Glaucopsyche cyllarus*, *G. iolas*, *Aricia astrarche*, *A. eumedon*, *Everes argiades*, and *Scolitantides baton*, whilst, in Bosnia, it occurs on the road between Focha and Celebic, in country where forests alternate with mountain-meadows brilliant with flowers and swarming with insects, among others *Lycaena arcas*, *L. arion*, *Polyommatus amandus*, *P. meleager*, *Agriades coridon*, etc. The species is abundant locally in Asia Minor, occurring everywhere in the mountains in Cilicia, as well as in the coast districts; Mrs. Nicholl says that it occurs on the chalkhills near Hasbeyah in the Lebanon district, but we believe the record refers to *A. corydon* var. *syriaca*, which was mistaken for the species under consideration. We know nothing of the habitats of the species in its extreme haunts in Persia.

British localities.—This species is very local, and restricted to a few southern counties of England; records outside these are to be considered with great suspicion.—[Argyll: near Oban, July, 1881 (Sturge, *Ent.*, xiv., p. 225). Wants confirmation very badly.] Bedford: near Bedford (C. G. Barrett), Barton Hills, rare (Gifford-Nash). Berks: Streatley district, Pangbourne, Sulham (Hamm), between Streatley and Blewberry (Holland), White-Horse Hill (Wheeler), between Newbury and Aldermaston (Rowland-Brown). Bucks: Clifden (Lewin) (hence its name of "Clifden blue"), Drayton Beauchamp (Crewe), now extinct absolutely, the ground having been recently cultivated (Rothschild), near Marlow (Clarke), High Wycombe (Peachell), on the Chiltern Hills between Kimble and Prince's Risborough (Rowland-Brown), Halton (Greene). [Cambridge: Newmarket, several specimens taken by Mr. Wagstaff many years ago (*Fenland*) (see Bloomfield, *Lep. Suffolk*, p. 57).] Devon: Seaton (Reading), Bere Regis, near Seaton (Tetley), near Torquay and Babbacombe, Anstey's Cove (Rogers), Chapel Hill (Reading), Sidmouth (Wells), Beer Head (Blathwayt), Dartmoor (Lester). Dorset: near Corfe abundant, Blandford (Bankes), Abbotsbury (Hopson), Sutton Poyntz, Chalbury Vale, Culliford Tree (Bogue), Sherborne (Douglas), Swanage (Hall), Hodd Hill (Nelson), Isle of Purbeck (Parmiter), Weymouth (Frohawk), Lulworth (Green), Puddle Hill, Knowle Hill (J. C. Dale *teste* Stephens), Buckland Newton, Portland (Dale). [Essex: near Saffron Walden, reputed to have been taken once or twice by Mr. Jos. Clarke (*teste* Harwood), wants confirmation]. Gloucester: local, but sometimes common—Clifton, Durdham and Coombe Downs, Henbury (Hudd), Cheltenham district (Robertson), near Stroud, Fairford. Bristol district, Rodborough, Amberley (Merrin), Wotton-under-Edge, local, and sometimes common (Perkins), Painswick (Watkins), Stapleton (Harding), Stonehouse (Nash). Hants: Isle of Wight— Apse Down (Bond), Ventnor, Brading (Prout), Freshwater (Bower), Sandown (Bull), Mottistone (Prideaux), Bullen, near Ryde (Jordan), Carisbrooke Castle (James), Bowcombe Down (Morey), St. Boniface Down and Bembridge Down (Poole), Winchester (Hamm), St. Catherine's Hill, near Winchester (Alderson), Worthy Down, near Winchester (Johns), near Silchester (Rowland-Brown). Herts: Tring (Rothschild), Dancer's End (Goodson), Royston (Kingston), Aldbury Down (Barraud). Hunts: St. Ives district (Norris). Kent: locally common on the chalk—the chalk-hills near Strood, Cuxton, Halling, Bush, Luddesdown, etc., between Rochester and Chatham and Maidstone, near Rainham, etc. (Tutt), Cuxton (Burrows), Chatham district (Sabine), Queendown Warren, Blue Bell Hill (Walker), Frinsted, near Sittingbourne (Mathew), Folkestone (Page), Cheriton (Heitland), Shorncliffe (Rogers), near Deal (Harding), near Dover (Curtis), Wye (B. W. Adkin), Westwell Downs, near Ashford (Russell), Ashford (Wood), Chilham Park, Dane Court (Stowell), between Dover and Sandgate (Cox), Lower Fant (Golding), Maidstone district (Goodwin), Shoreham (Bower), Seal Chart (Carrington), near Darenth Wood (West).

[Lancashire: near Lytham (Renshaw, *Ent.*, xxiv., 267), afterwards noted by Renshaw (*Ent.*, xxv., p. 173) as being wrongly recorded, the species being *P. icarus.*] [Middlesex: Pinner (Carrington), wants confirmation; Rowland-Brown says that the record is "quite impossible."] Oxford: Watlington, Pyrton Hill (Bell), Caversham (*Ent. Rec.*, iv., p. 59), Hardwicke (Holland), Oxford district, sparingly (Shipp). Somerset: very scarce in the county—Polden Hills, near Bridgwater, Pickeridge, near Taunton, Rudstock and Stoke-sub-Hamdon (Hudd), Buckland, Dinham, near Frome (Mathew), Bath (Ridley), Weston-super-Mare (Crotch). [Suffolk: Moulton, Dalham (Miss Jermyn, *Butt. Coll. Vade Mecum*, p. 75). Probably an error, Bloomfield, *Lep. Suffolk*, p. 7.] Surrey: locally common on the chalk—Clandon, Box Hill (Turner), Godstone Road (Stainton), Kenley (Carrington), Guildford (Stephens), Kingswood, near Reigate (Phillips), Ripley (Simes), Caterham (Bower), Reigate (Image), Croydon (A. Hall), near Dorking (Trimen), Oxted, Purley (Sheldon), Ranmore (Oldaker), Gomshall, Betchworth, Hog's Back (Goss), Sheep Leas, Horsley (Champion), Riddlesdown, Park Down (T. B. Fletcher), Redhill (Buckell), Mickleham (Newman), Banstead (Adkin). Sussex: locally common on the chalk, and on all the downs between Hastings and Brighton (Stephens), Brighton Downs (Draper), Hollingbury Coombe (Image), Malling Hill, East Dean (Jenner), Beeching chalkpit (White), Eastbourne (Montgomery), Lewes (B. W. Adkin), Beachy Head (Hawes), Balcombe district, not common (Hamlin), near Abbott's Wood (Dale), Burgess Hill district (Dollman), Glynde, Hailsham (James), Steyning (White), between Brighton and Lewes, in Bible Bottom, and on Cliff Hill, near Lewes, between Eastbourne and Beachy Head, Ripon Down, Broadwater, Hastings, between Bramber and Shoreham (W. H. B. Fletcher). [Warwick: near Birmingham (Weaver *teste* Stephens). Almost certainly an error.] Wilts: Devizes, rare, Winsley (Sladen), Amesbury Hill (Rudd).

Distribution.—Confined to the area bounded by the southern shore of the Mediterranean on the south (about 35° N. lat.), Persia on the east, 50° E. long., the north of Germany and Denmark on the north, about 54° N. lat. (a little higher in Denmark, and lower in England), and west by the Atlantic sea-board of France, Spain, and Portugal.—Africa: Algeria—Lambessa, Magenta, Sebdou (Oberthür); Morocco (*teste* Blachier). Asia: Asia-Minor—Tche Kirghé, Broussa, Amasia (Fountaine); Cilicia (Holtz); [Syria—Hasbeyah, in the Lebanon district (Nicholl);] North Syria—Shar Deresy (Leech coll.); Persia—Tage, Bostan (J. de Morgan), Irak district (Young); North-west Persia—Urumiah (Brit. Mus. Coll.); north-east Persia—Kuldsar (*teste* Bethune-Baker). Europe—Austro-Hungary: Bohemia, generally distributed—Posthofwiese, Plobenwiese, towards Pirkenhammer (Hüttner), Prague, Senftenberg (Fritsch); Moravia—Brünn, abundant (Schneider), Kremsier, Mistek, Neutitschein, Rottalowitz (Fritsch); Upper Austria, distributed throughout—Freistadt, Kirchdorf, Linz (Fritsch), Ischl (Hormuzaki); Lower Austria, abundant throughout—Vienna (Rossi), Gresten (Schleicher), Hernstein district (Rogenhofer); Salzburg—Salzburg (Nickerl), Rossfeld, near Hallein, Gaisberg (Richter); Tirol—in the northern, central, and southern parts, from 650 mètres to 2700 mètres—Schlücken Alp, Stubai Alps, Seiser Alp, Trafoi (Heller), Bozen, the Sarnthal (Tutt), Trient (Mann), the Dolomites—Misurina, Cortina (Mann and Rogenhofer), Brenner district (Galvagni), Innsbruck to 6000ft. (Weiler), Stelvio district not rare (Speyer), Gomagoi (Tutt), Bregenz (Fritsch); Carinthia—Flitsch, Preth (Zeller), Lavantthal, St. Paul mountains, rather rare, Friesach, Pörtschach, the Bleiberg valley, Pressegg, Möllthal and Glockner district, on the Pasterze (Höfner), Hausdorf, St. Jacob (Fritsch); Styria—Cilli (Fritsch), Enns Valley—Admont, near Hall (Strobl), lower parts of Scheiblingstein (Kiefer); Istria—Trieste (Zeller), near Miramar, Pirano (Mathew); Carniola—Adelsberg (Hoffmann); Dalmatia—Zara (Wagner), Val d'Ombla, near Ragusa (Nicholl); Spalato (Brit. Mus. Coll.); Croatia—Josefsthal (Mann), Agram district, Podsused (Grund); Dobrudscha—Tultscha, very common (Mann); Hungary—Herculesbad (Lang), Budapest (Lemann). Budafok (Aigner), Svábhegy (Sheldon), between Budafok and Kelenfold, Cserna (Rosa), Peszér, Nagyvárad, Pécs, Sopron, Pozsony, N. Lévárd, Tavarnok, Moki, Salmerzbánya, Gács, Rozsnyó, Igló, Eperjes, Kassa, Szilicza, Hufza, N. Bocsko, St. Gothárd, Gyake, Tegesvár, Nagyszeben, Nagyág, Réa, Mehádia, Orsova, Vinkovcze, Lipik, Szeged, Bélenyes, Tapoleza, Felsölövö, Beszterazebanya, Trencsin, Josipdol, Plitvicza, Fiume, Buccari, Pastorá, Novi (Aigner-Abafi); Moravia—Oberweiden (Habich), Javorina, Bresztova (Vángel); Galicia—Livow, Janow, Limberg sandhills, Czapli, Bileze, Paskowej (Nowicki), Cracow, Bielany, Dziekanowice (Zebrawski); Bucovina—Cecina Mt., near Czernowitz (Hormuzaki). Belgium: the greater part of the country, but chiefly the limestone region—Namur, Dinant, Warnant, common (Lambillion), Marche-les-Dames, common (Charlier), Embourg, common (Donckier), Elderen (Derenne), Ortho (Slégers), Rochefort (Carlier). Bosnia and Hercegovina: local and not common, up to 1200m.—Focha to Celebic (Nicholl); Sarajevo—Lukavica (Apfelbeck), Kalinovik (Schreitter), Prozor, Jablonica (Hilf), Prenj—Lucina at 1500m. (Penther), Nevesinje (Uhl), Stolac (Winneguth), Volujak, Metovic (Apfelbeck), Jaice, Jesero (Elwes). Bulgaria and East Roumelia: the north slopes of the Balkans, near Slivno, the Vitoch, near Sofia, common, the Rilo mountains—the Rilska valley (Nicholl), near Lom (Elwes), Rasgrad, Rustschuk, Varna (Haberhauer), near Ortos, common (Rebel). [Channel Islands: Jersey (*teste* Coney).] Corsica (Coleby). Denmark (Dohermann, Brit. Mus. Coll.). France: generally (Berce), and throughout Brittany (Griffith)—Ain—Thoiry (Blachier); Allier—Vichy (Oberthür); Alpes-Maritimes—St.-Martin-Vésubie, the Val Muerta near Beaulieu (Rowland-Brown), Beaulieu (Jones), Cannes, very common (Warburg), Nice (Lang); Ardèche—Celles-les-Bains (coll. Fallou); Ariège—Ax-les-Thermes; Aube—common (Jourdheuille); Aude—les Corbières, Conques (Mabille), Axat (Tetley); Basses-Alpes—very common, Digne, between Colmars and Allos, Larche (Tutt), Barcelonnette, Allos, Beauvézer, St. André, etc. (Rowland-Brown); Basses-Pyrénées—Gonat (Burr); Bouches-du-Rhône—throughout (Siépi); Calvados—local, environs of Caen, rare in the Auge district (Fauvel); Charente—near Angoulême (Moore); Charente-Inférieure—Royan (Salis), Dompierre-sur-Mer (Oberthür); Cher—Sologne, St. Florent (Sand); Creuse—Guéret (Sand); Dordogne—Liorac, Lembras, le Monzie-Monastrue, Queysac, Floyrac, la Mouthe, Cerand, etc. (Tarel); Doubs—environs of Besançon (Bruand); Eure—Pont de-l'Arche (Dupont); Eure-et-Loir (Guenée); Gard—Ste. Cécile d'Andorge (Rowland-Brown); Gironde—Villeneuve de Blayc (Mège), environs of Bordeaux, Budos, common (Rt. Brown), Bouillac, Floirac, Fargues, etc. (Trimoulet); Haute-Garonne—St. Martory (Aubusson), Bouconne, Revel, Villefranche, Aspet, Encausse, St. Béat, Cagire, Luchon (Caradja); Haute-Marne—everywhere, *e.g.*, Hortes (Frionnet); Haute-Savoie—Monnetier, Yvoire (Blachier); the Voirons (Reverdin), Grand Gorge, Mt. Saléve (Tutt); Hautes-Alpes—le Lautaret, Bourg d' Aru, Bourg d' Oisans (Tutt), La Grave (Lowe); Hautes-Pyrénées—throughout, up to 1200m. (Rondou), Pierrefitte-Nestalas (Jones); St. Sauveur (Elwes), Gavarnie, Cauterets, Lac de Gaube (Rowland-Brown); Indre—Nohant, Gargilesse (Sand); Brenne, rather rare (Martin); Isère—Uriage (Reverdin); Loir-et-Cher—banks of the Loir, etc. (Chevillon); Loire-Inférieure—Chemeré, Machecoul (Deher-man-Roy); Lot—Souillac (Bentall); Lozère—very common on the slopes of the Causses, *e.g.*, Mende, Florac, la Caze, etc. (Rowland-Brown); Maine-et-Loire—Angers (Cheux); Manche—1 ♂ and 1 ♀ near Hainneville (Nichollet); Marne—Rheims district, common (Demaison); Meurthe-et-Moselle—approaches to the wood of Vandœuvre, Nancy (Cantener); Nord—not rare in the forest of Mormals, but not elsewhere (le Roi); Oise (Pinard)—forest of Compiègne (Boisduval); Puy-de-Dôme—generally on the chalk formation (Guillemot), Royat (Sand); Pyrénées-Orientales—le Vernet, common (Rowland-Brown), Valley of St. Vincent, Vallée du Lys (Tetley); Saône-et-Loire—fairly common, but local—la Grisière, St. Leger (André); Sarthe (Desportes); Savoie—Bourg St. Maurice, Grésy-sur-Aix (Tutt), Brides-les-Bains (Reverdin); Seine—environs of Paris (Goossens), la Varenne, St. Maur (Ragonot), Montrouge (Fallou), Bois de Boulogne (Bellier); Seine-et-Marne—common everywhere (H. Brown), Fontainebleau (Tutt), Gurcy (Bellier); Seine-et-Oise—common (H. Brown); Seine-Inférieure, common—near Sauchay (Moore), Orival(Martel); Somme (Frionnet); Var—Draguignan (Tutt); Vaucluse—Avignon(Walker), Brantes, Malaucène (H. Brown); Vendée—Auzay, near Fontenay-le-Comte (Oberthür); Yonne—Mailly-la-Ville, forests of Pontigny, and of Fretoy (Mabille). Germany: distributed over the southern half, and in the mountains of central Germany, in the north, in a few places east of 29° E. long., but nowhere west (Speyer); East and West Prussia—Braunsberg, Thorn, Dantzig (Schmidt), Graudenz, the fort Courbière (Riesen), Memel, Tapiau, Osterode, Allenstein, Rominten, Johannisburg, Niedenburg, Löbau (Speiser); Pomerania—rare, the Schwalbenberge, near Garz (Hering). [Mecklenburg—Lübeck (Paul), Sülze (Koch), Neustrelitz (Messing), Rülow, rare (Sponholz)—Schmid says that the specimens determined by Koch as this species, were merely bright-coloured *P. icarus*, and that the name must be struck off the list for this province.]; Hanover—Bassum, near Bremen, twice only (Rehberg); Rhine Provinces—Urdenbach (Kirby), the Rhine dike, between Budberg and Friemersheim (Stollwerck), Neuenahr (Maassen), Crefeld, the Budberg and

Mündelheim dike, the Linn meadows, in the Sankert (Rothke), Deutz, Bonn, on the Ahr, the Brohl valley, Boppard, Bingen, Trier, Uerdingen (Stollwerck); Westphalia —Warburg, Asseln, Germete, Königsberg (Uffeln); Hesse—the Mörfield road, Seckbach hill, at 600ft., Bieber Hill, Mombach forest (Koch), Wiesbaden (Prideaux), Frankfort-on-the-Main, the Taunus (Glaser), Rheingau, near Geisenheim (Schenck *teste* Glaser), Hanau (Limpert and Röttelberg), Cassel, the Lindenberg, singly (Borgmann); Waldeck—Wildungen, Korbach, Rhoden, not rare, the Quast and Eichholz, abundant (Speyer); Thuringia—frequent in the plain, rarer in the foothills, Arnstadt, Schala, Schremse, near Rudolstadt, the north side of Frauenberg, Hachelbich, near Sondershausen (Krieghoff), in the Thuringia forest, Gotha, Siebleber Holz, Berlach, Hirzberg, Wachsenburg, near Arnstadt (Knapp), near Jena (*Ent. Ver. Lep. Gera*), Rudolstadt (Jordan); Province of Saxony—at Erfurt, on the Schwedenschanze, Castle Haarberg, south-eastern part of Steigerwald (*Ent. Ver. Erfurt*), at Halle, near Seeben, Gutenberg, towards the Bergholz, Knapendorf (Stange), the Petersberg (Richter); Mühlhausen district, at Hainich (Speyer), Naumberg, Nordhausen, Quedlinburg (Jordan), Hartz, Brunswick and Hanover—in the foothills of the Hartz (Blauel), Selkethal (Suffrian), the southern slopes of the Hartz (Heinemann), Upper Hartz, Achtermann's Höhe, once (Hoffmann), Osterode, Brunswick, Helmstedt, Göttingen (Jordan); Brandenburg—Neu Ruppin (Nürnberg), Frankfort-on-Oder, near Simonsmühle and the Oder banks, singly, the Schwedenschanze, rare (Kretschmer); Posen—Posen not rare, in the Eichwald, Moschin (Schultz), Meseritz (Zeller); Silesia—the lowlands and the Trebnitz mountains (Döring), Peterwitz to Pfaumdorf, the Bitke, very abundant (Nohr), the Hohenburg, near Herwigsdorf, Zittau, rare (Möschler), Schönberg (Sommer); Kingdom of Saxony—Zitzschewig, once (Steinert), the Spitzberg, near Oderwitz (Schütze), Rosswein, very rare, Weinböhla, Frauenstein-Richenau, Freiberg, very rare, Deuben, near Dresden (*Ent. Ver. Dresden*); Bavaria—Planegg, near Munich (Freiherr v. Gumppenberg), Regensburg (Hofmann and Herrich-Schäffer), Oberstdorf, in the Allgau Alps, Oythal, the Seealp, Sölleneck (Dadd), Munich (Kranz), Augsburg; in the Siebentischwald, hills near Friedberg, Bergheim to Strassberg, Lechplain (Freyer), Kempten (Kolb); Wurttemberg—Stuttgart, Tübingen, Reutlingen, valleys of the Neckar, Jaxt, Kocher (Seyffer); Baden, distributed in the lower mountains—Black Forest (Walker), Bruchsal (Gauckler), Constance, around the sources of the Danube, Istein, Freiburg (Schönberg), Kaiserstuhl, Schmieheim, near Ettenheim, the Altvater at Lahr, Rippoldsau, Durlach, Heidelberg (Reutti), on the Turmberg, Maxau (Gauckler), Weinheim, Speier (Meess and Spuler); Rhine Palatinate (Linz and Bertram). GREECE: Parnassus (Brit. Mus. coll.). ITALY: Liguria (Curò); Piedmont—Certosa di Pesio (Lowe), Turin district (Rocci), Bobbie, Aosta, Pré St. Didier, Susa, Châtillon, Val Anzasca (Tutt), Orta (Lowe), Iselle (Reverdin), Val d'Antigorio (Blachier), Val Vigezzo (Carlini), Val di Vedro (Forbes); Lombardy—Como, Bellagio, Menaggio (Forbes), Torbole, on Lake Garda (Wagner); Campania—Esperia, Aurunci mountains (Barraud); Tuscany, common throughout—Leghorn, Pisa, Pratovecchio (Calberla), Fuligno (Zeller), Apennines—Boscolungo (Norris), Pistoiese Apennines—San Marcello, Vallombrosa, Lucca coast, abundant (Verity), Fiesole, Assisi (Wheeler); Naples—Formia (Querci *teste* Jones); Sicily, not common (Fountaine), Osimo (Spada); The Marches —Sassoferrato (Calberla); Abruzzo (Calberla). PORTUGAL: near Alferce (Eaton), San Fiel district—Portas de Rodão (Santos), Sétubal district (Vielledent), Estoril (Oldfield). ROUMANIA: Everywhere common—Grumazesti, Dulcesti, Comanesti, Jassy, Valeni, the Dobrudscha (Fleck), Bucharest (Burr). RUSSIA: St. Petersburg government (Tengström); Podolia—Bagovitza (Grum-Grshmailo); Govt. Poltawa (Markoff); Urals—Ufa dist., Alexandrowski-Sawod, 56° N. lat. (Golubzow *teste* Huene); Central Caucasus (Schaposchnikov); Transcaucasia —throughout (Romanoff), Borjom (Brit. Mus. coll.). [SCANDINAVIA: Westergothland, Christiania (Wallengren). Siebke considers the Norwegian records doubtful, and thinks they refer to abs. of *Polyommatus icarus*. Schöyen omits the species altogether in his list (*Ent. Mo. Mag.*, 1890).] SERVIA: near Belgrade, Ak-Palanka, Nisch (Hilf). SPAIN: Leon—Picos de Europa (Nicholl); Panticosa, near Jaca (Burr); Asturias—Bilbao (Seebold); Catalonia—Caldas de Maravilla (Nicholl), Montsény (Witty), Montserrat, Barcelona (A. H. Jones), Begas, from San Pedro Martir to Moncada (Martorell); New Castile—the Alkededores of Madrid, S. Ildefonso (Figueroa), Aragon, common—Canales (Chapman); Teruel district—Albarracin, Gea, Rodenas, Valdecabriel, Camarena (Zapater and Korb), the gorge of the Guadalaviar, near Albarracin (Sheldon); Andalusia—Granada (Rambur), Ronda (Lang), San Roque, Malaga (J. J. Walker). TURKEY: Macedonia—Olympus (Brit. Mus.

coll.). Switzerland: Basle—Basle (Knecht), Liestal (Christ); Berne—Berne (Jäggi), Macolin (Reverdin), Interlaken (Wiskott), Wengen (Moss), Gimelwald (Wheeler), Kanderthal (Forbes), Kandersteg (Bath); Freiberg—near Bulle, banks of the Sarine, near Gruyères (Rowland-Brown); Geneva—Geneva district, Hermance, Bois-Taille, Bois-des-Frères, Allondon (Reverdin), Versoix (Tutt); Gaillard (Muschamp); Grisons—the Albula Pass, above Preda, Weissenstein (Tutt), Bergün (Zeller), the Via Mala (Tutt), Chur (Forbes), above Chur, 1900-2000 mètres (Stange); Roseg-Thal (Keynes), St. Moritz, Pontresina (Nicholson), Muranza-Thal, Santa Maria to Münster, Zernetz, Ofen Pass (Tutt); Lucerne—Lucerne district (Sanford); Schwyz — Brünnen (Jones); Solothurn — Dorneck (Frey); Ticino — Locarno (Tutt), Cassarate, Gandria (Tutt coll.), Lugano (Jones), Chiasso district (Knecht), Fusio (Chapman), Campolungo Pass (Muschamp), Airolo (Dadd); Uri—between Engelberg and Schwand (Keynes); Valais—Rhone Valley, Vernayaz (Page), Martigny (Rehfous), la Bâtiaz (Tutt), Plan Cérisier (Reverdin), Follaterre, Branson, Sion, Sierre (Wheeler), Montana (Lowe), Val d'Hérens (Tasker), Vex, Useigne, Combe d'Arolla, Haudères to Satarme (Tutt), Val d'Anniviers (Rowland-Brown), Niouc (Reverdin), Visp (Tasker), Zermatt (Lemann), between Stalden and Zermatt, Saas-Fée (Tutt), the Riffelberg (Jordan), Salquenen (Alderson), the Pfynwald, Brig, Bérisal (Wheeler), Simplon (Muschamp); Vaud—Val de Joux, Isle, Mt. Tendre (Mory), Dent de Vaulion, Asile de Molendreuz (Gibbs), Neuchâtel (Rowland-Brown), Eclépens, St. Georges (Wheeler), Rossinières (Tasker), Mt. Pélerin (Tetley), Chexbres (Walker), between Montreux and les Avants (Rowland-Brown), between Caux and Sonzier, Territet (Tetley), Veytaux, the Tinière Valley, Villars, Lavey (Wheeler), St. Triphon (Alderson), Aigle, Sépey (Tasker), Bex (Murray); Zürich—Zürich district (Brit. Mus. coll.).

ERRATA.

p. 372, line 4, for "larger" read "longer."
p. 376, line 37, for "wing spine" read "wing base."

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